

Consulting Engineer

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The Professional Way

FRANK M. CARHART, president of Boston's Jackson & Moreland, Inc., considers consulting engineering a "profession, in every sense of the word." No other learned profession is more exacting in its demands; nowhere are there more imposing problems to be solved. Carhart also believes

Continued on page 8

The Consulting Engineer's Professional Magazine

...more

POWELL VALVES

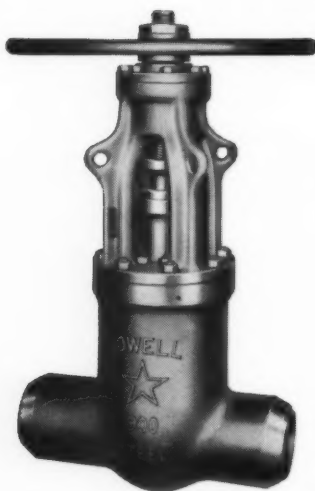


FIG. 19003—900 Pound Pressure Seal Steel Gate Valve.

FIG. 2608—Bronze "WS" Full Flow Globe Valve for 200 Pounds W.P.

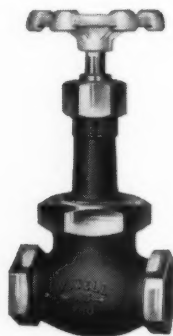
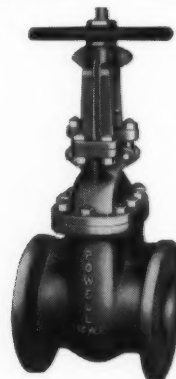


FIG. 1793—Iron Body Bronze Mounted O.S.&Y. Gate Valve for 125 Pounds W.S.P.

FIG. 2453-G—Stainless Steel O.S.&Y. Gate Valve for 150 Pounds W.P.



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Consulting Engineer

The Consulting Engineer's Professional Magazine

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CONSULTING ENGINEER is published monthly by Consulting Engineer Publishing Company at 217 Wayne Street, Saint Joseph, Michigan. Price 1 year \$10.00; foreign \$15.00; single copy \$1.00. Accepted as Controlled Circulation Publication at Saint Joseph, Michigan. Copyright 1957 Consulting Engineer Publishing Company.

BPA



INTEGRAL DISTRIBUTION CENTER. A new concept in distribution centers. In one unit you get incoming line, transformer and outgoing feeder. This simplifies ordering and substantially reduces installation time. Besides, this unit is lightweight and compact, measuring only 78 inches high, 37½ to 42½ inches deep and from 48 to 106 inches wide depending on the accessory equipment required. It comes in standard ratings from 75 to 225 kva and from 480 to 15,000 volts, primary.



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GENERAL  **ELECTRIC**

—Starts on front cover

that engineers in private practice are professionals in another sense. "Like the professional ball player," he says, "the engineer is expected to act with speed and precision, and he is allowed few errors."

Carhart, who has been a consulting engineer for 35 years, first became interested in engineering when he was a small boy on an Idaho sheep ranch. "Dad wanted me to go to Massachusetts Institute of Technology," Carhart recalled, and his father's wish was fulfilled when the son was graduated from MIT as a Civil Engineer.

Started on the Board

As he encourages the young engineers in his firm to do, Carhart began his career as a draftsman, first working for an architect and then with several engineers in Idaho and eastern Oregon. Later he worked as Assistant State Engineer and as Chief Engineer of the Carey Act Department for the State of Idaho, and as special engineer on backwater investigations for the Idaho Power Company. While working with the Idaho Power Company, Carhart met Dr. Thomas Conway, Jr., of Philadelphia, and in 1922, he went to work with Dr. Conway, who was in private practice in Philadelphia.

The next year, Carhart joined Jackson & Moreland as Department Manager in charge of rate studies, operating, financial, appraisal, and other economic matters—principally for large public utility properties. In 1927, Carhart became a member of the firm, and in 1930, he was named a general partner. He became senior partner in 1951 and was elected President when Jackson & Moreland incorporated, in 1955.

Firm History

Jackson & Moreland is the outgrowth of a partnership formed by D. C. Jackson and William B. Jackson, in 1902. The two Jacksons added a third partner, E. L. Moreland, in 1916. The three engineers, strong believers in the virtue of action above theory, laid aside all business projects and joined the Armed Forces when the United States entered World War I. In 1919, after the war, the firm was reorganized as a partnership of D. C. Jackson and E. L. Moreland. When Jackson retired in 1930, Carhart and R. D. Booth became general partners. Moreland died in 1951.

Two years ago, Jackson & Moreland was incorporated. The reason for this was to secure the continuity and managerial flexibility of the corporate form. The Company employs approximately 675 persons, which includes a staff of more than 500 engineers, designers, and draftsmen.

"This is about as large as an engineering organization can become and still permit the active participation by its management in the firm's professional practice that Jackson & Moreland always has considered essential," Carhart explained. "When this active participation is lost, an engineering firm becomes only a business enterprise, and the basic objection to the corporate practice of engineering is given substance."

Favors Corporate Practice

"I have never understood the strong opposition to corporate practice that exists in some areas," he said. "Large projects are the rule now, rather than the exception, and they require a large engineering organization to handle them. As a practical matter, the corporate form is a much more suitable and efficient device for managing the business affairs of such an organization than is individual ownership or a partnership. Managerial flexibility is one reason. The continuity of corporate existence regardless of what happens to individual members of the management group is another. Engineers should not apply inefficient management techniques to their own affairs just because, traditionally, shoemakers' children wear the poorest shoes."

"I cannot accept the argument that professional responsibility is destroyed by corporate practice. Certainly we feel just as responsible today as we did when we were a partnership—and so do our people. If we did not accept professional responsibility for the work we do, individually and collectively, we would have no clients, whether we were a partnership or a corporation."

"I do not think I would like to see engineering corporations run by laymen, or operated like a grocery business. But as long as management remains in the hands of registered professional engineers, I see no cause for alarm."

Many persons believe that a majority of members on the board of directors of an incorporated consulting engineering firm should be registered engineers. Carhart disagrees. He maintains that all engineering is done on a staff level and that the purpose of a board is to provide guidance in the handling of financial and policy problems facing the corporation. The board should have professional engineer members and should be guided by their judgment in decisions involving professional or technical matters, but to require a majority of the board to be registered engineers is impractical.

Personal Experience

Much of Carhart's work with Jackson & Moreland has consisted of preparing economic reports for large public utilities. Clients include many of the important utilities, both privately and publicly owned, along the Atlantic Seaboard, in the Midwest, and in the South and Southwest. He also was a di-



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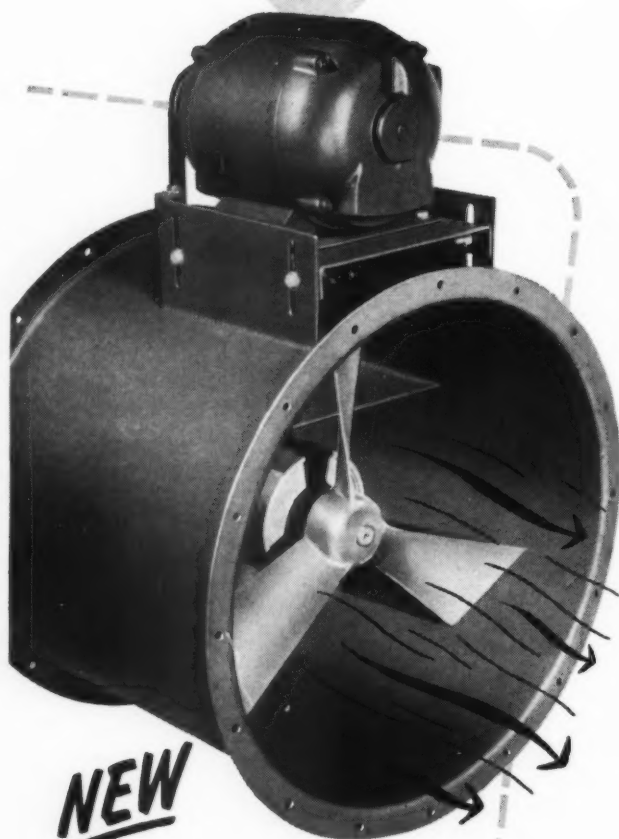
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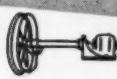
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KEY

MOVING AIR IS OUR BUSINESS

rector of the Overseas Consultants, Inc., which prepared a reparations report on Japan for the Army.

Carhart has appeared as an expert witness in many legal cases on such matters as valuation, depreciation, economic studies, expropriation, rates, refinancing, mergers, and consolidations, before courts and state and federal regulatory authorities in the United States, Canada, and the West Indies. He is presently the responsible officer for Jackson & Moreland, Inc. in representing the bondholders of the Puerto Rico Water Resources Authority.

Boston and New York

Jackson & Moreland's principal office is in Boston, where all engineering work of its various divisions is done. The Company has 119 structural employees; 130 electrical; 149 mechanical; 56 in machine design; 77 working on technical publications; 26 assigned to valuation projects; and 118 in general and administrative work. The New York office is used primarily for executive and contact headquarters—"an outpost in the provinces," Carhart explained.

One of the Company's major activities is the design of steam-electric generating stations, with seven now on the boards or building. Valuation work, rate studies, and economic investigations (Carhart's particular field) occupy another important segment of the Company's practice, as do machine design and the preparation of technical publications—the writing, illustrating, and editing of instruction manuals, catalogs, and technical reports. "We've been in the technical publications field as long as anyone has," Carhart added.

How Fees are Set

Carhart considers a firm's methods of getting and charging for projects one indication of how well it fits the term "professional."

"A doctor is not asked to bid on the price of an operation. Yet we have been asked to bid lump sum on large projects."

Jackson & Moreland bases its fees for design and supervision of construction on salaries, administration overhead, and expenses, plus a percentage of the cost of the project. As the project progresses, the client is billed monthly. The percentage fee may be computed from time to time on the amount of construction accomplished or in total at completion.

"Of course, you cannot really generalize on how fee schedules are worked out. It varies with the project and with the client. On some small projects of short duration, we use a percent-of-salary for fee. And on these, we usually do not bill until the project is completed."

Carhart thinks one of the most difficult problems facing consulting engineers today is that of attracting adequately prepared young men. Competition for electrical and mechanical engineers by the glamorous industries—electronics, aircraft, and missiles

CONSULTING ENGINEER

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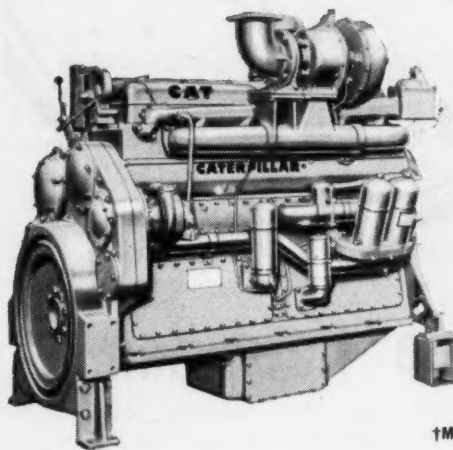
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390 HP†

Length 75½"
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For complete information about the new D353 and other Cat Diesels, see your Caterpillar Dealer. Let him show you how diesel leadership based on a quarter century of experience can engineer the modern heavy-duty diesels of tomorrow.

The new Cat D353 Engine is a six-cylinder, four-cycle, valve-in-head turbocharged diesel. It is available as an electric set rated at 200 KW (continuous duty) and as a marine engine. A full line of matched attachments is also available — items such as air, electric and gasoline starting systems; clutches; bases; controls and governors; cooling systems and mufflers.

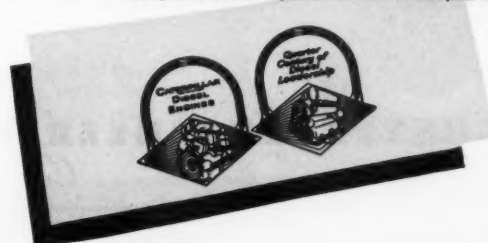
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work — is particularly keen. "We have no rich Uncle, and we cannot compete with the advertising spreads, the campus recruiting teams, the expenses-paid tours to inspect the home plant, and the country club entertaining. I do not think we would if we could. Engineering, as a profession, is not practiced in that sort of atmosphere. Youngsters who are persuaded by such methods to accept a job are apt to be both disappointed and disappointing. Perhaps some of these firms have let the employment of engineers pass from engineers into the hands of a group of professional recruiters.

Young Engineers

"I have no complaint about the quality of the young men we get from the colleges. I just wish we could get more of them. We need them!

"In our contacts with the engineering colleges, we are finding a decline in interest in the power field. Many schools have abandoned the power option course because the students no longer want it. The feeling seems to be that power no longer offers any challenging problems, that all the interesting things have been done, that there are no more real opportunities in power, that able young engineers had better look elsewhere.

"Nothing could be farther from the truth. There are great opportunities ahead in the power field, in part because it has been somewhat neglected lately, but principally because of developments that are coming. Indications are that we will build in this country as much new generating capacity during the next 10 years as we have built in all the years up to this time. The solution of the transmission and distribution problems that will come with doubling our generating capacity, the development of nuclear power, the more effective integration of our power producing facilities for economy and reliability, and a thousand other problems will demand the best engineering brains we have.

"At present this firm is preparing many of our young engineers for the future with specialized training in nuclear power work. We have been active for many years in the nuclear field, and we are trying to make sure our staff will be ahead of the times on all future nuclear developments."

Organization Activity

Carhart, a registered engineer in six states, long has been active in professional organizations. He is a Fellow of the American Institute of Electrical Engineers. He also is a Member of the American Institute of Consulting Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the Boston Society of Civil Engineers, the Massachusetts Society of Professional Engineers, the American Gas Association, and the American Association for the Advancement of Science. ▲▲

continuous through-truss bridge...

High Strength USS TRI-TEN "E" Steel reduces dead weight 400 tons

THIS imposing structure, the Shawneetown Bridge, straddles the Ohio River at Shawneetown, Illinois. Its total length is 3,200 feet. Each approach consists of a 150-foot simple truss, a two-span continuous deck truss and three units of three-span continuous beams.

The two main spans deserve your particular attention. Designed to meet navigational requirements, they are each 825 feet long—the longest spans of their kind in this country.

Because in spans of this length, dead-load stress is about 80% of the total stress in the main members, reduction of dead load is highly desirable and can result in real savings. For this reason, USS TRI-TEN "E" Steel was specified for the main spans.

Built with USS TRI-TEN "E" Steel, top and bottom chords, diagonal truss members, bottom laterals and other highly stressed members weigh only 80 to 85% of what they would weigh if built of structural carbon steel. As a result, the 2,350 tons of USS TRI-TEN "E" Steel used in the main spans eliminated over 400 tons of dead load.

The bridge was erected by cantilevering and these lighter trusses brought an additional advantage: reduced loads during erection.

. . .

Designers of steel structures, who have long sought to reduce dead load safely, have found in USS TRI-TEN "E" Steel an answer to their problem that is both practical and economical—particularly where long spans are concerned.

With a minimum yield point 50% higher than that of structural carbon steel (ASTM A7) in thicknesses of $\frac{3}{4}$ " and less, USS TRI-TEN "E" Steel can safely be used in lighter sections to reduce weight and save steel. And these savings don't end with material costs. As proved in the many important bridges built with this stronger and more durable steel, lighter-weight structures mean lower freight costs as well as reductions in the size and cost of foundations. These savings, in some instances, have totaled as high as 15% of the cost of the structure.

Our engineers will be glad to show you how USS TRI-TEN "E" and our other USS High Strength Steels—USS COR-TEN and USS MAN-TEN—can be used to provide maximum strength, safety and durability with a minimum of weight and costs. Have you a copy of our new "Design Manual for High Strength Steels?" For your free copy, write on your company letterhead to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

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UNITED STATES STEEL



Readers' Comment

Representing Lloyds

Sir:

I recently read with much interest your staff report in the September issue of **CONSULTING ENGINEER** titled "Errors and Omissions." I am writing to you in my capacity as a licensed Ex-

cess and Surplus Line Broker representing Lloyds of London.

While your article is very informative and performs a valuable service to your readers, I can't help but feel that you have, in a sense, slanted the issue as respects any member of your profession who holds, or desires to hold, a Lloyds' policy.

Your reference to the various States' Surplus Line Law is basically correct in that an affidavit must be filed with the State to

the effect that American companies have refused to write this risk. The affidavit form varies from state to state but generally requires that three licensed companies be so designated. As far as the affidavit is concerned the only requirement is that three authorized companies be offered this business and refuse. It is a known fact that the intent of the Law is that if the coverage can be obtained locally it should be. We have always subscribed to this and as you aptly put it, a broker for Lloyds cannot honestly say that any American company will not write this business when he knows that the Continental Casualty will, or unless he has submitted it to Continental Casualty and been refused. This, of course, would just about preclude the issuance of any Group Plan thru Lloyds because obviously some member of the group at one point or another could obtain this cover and, therefore, the entire group cannot properly file the affidavit. However, in an individual case, if an architect or engineer cannot meet the Continental requirements such as furnishing a brochure, etc., and three other authorized companies have refused, he can rightfully purchase his coverage thru Lloyds. It is not necessary, as you state in your final paragraph called "The Picture," to go to a Canadian broker or to a state that has no Surplus Line Law.

The main point to which I am taking exception is that by calling this coverage illegal, by stating that Lloyds cannot issue these policies for new or renewal, I believe you have created in the minds of those professional engineers who now have Lloyds coverage, or desire it, the impression that their policies are void. Your continued reference to the illegality of it challenges the coverage. Now while the transaction in itself may be illegal the one who must attest to the affidavit, as to its legality, is the Licensed Surplus Broker. He would be leaving

Neff & Fry Silo used for calcined coke

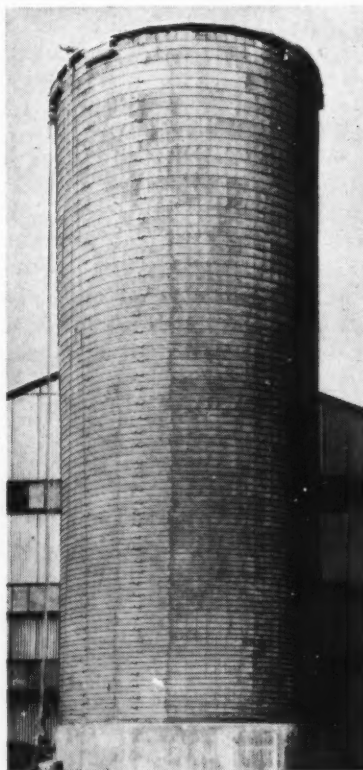
Many of our silos are currently being erected for handling and storing calcined coke. Scores of them have been in use for the same purpose over the years. The photograph shows one such installation in Pennsylvania. It is 24 ft. dia. x 60 ft. high.

There are a number of special problems in designing systems for handling calcined coke and other materials of similar consistency. Our knowledge of the subject can be of great practical value. We'll be glad to communicate or confer with you.

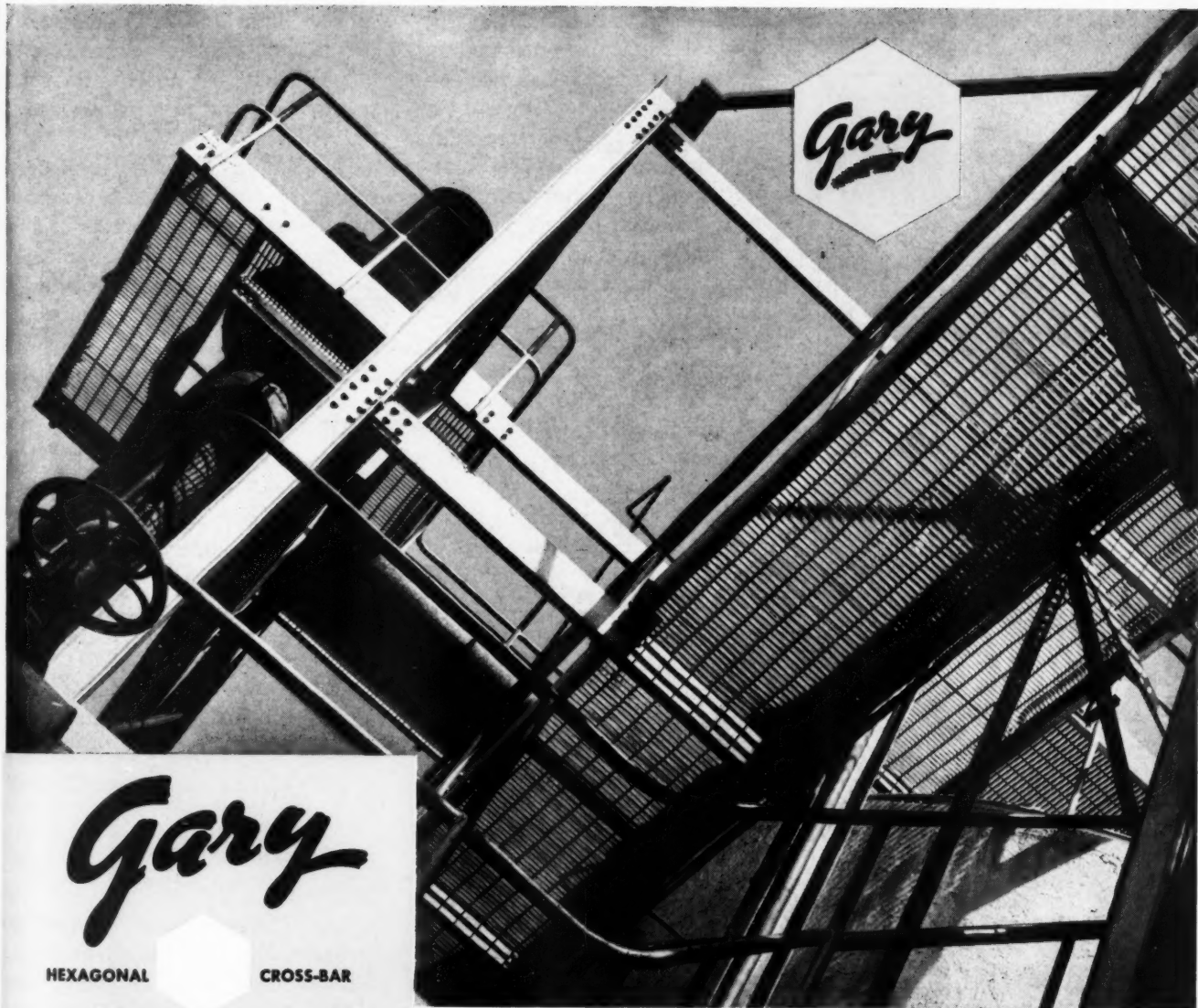
Our silos are constructed of Super-Concrete Staves with diagonal ends which permit steel hoops to impinge directly upon the horizontal joints. As many intervening hoops are installed as needed to met the lateral thrust of the contents. This is clearly explained in our folder, "Bins With the Strength of Pillars." A copy is yours for the asking.

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LIGHT WEIGHT

for greater load-carrying capacity.

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for reduced maintenance costs.

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for maximum ventilation and light.

TAILOR MADE

for most economical installation.

TAILOR—MADE FOR EACH INSTALLATION...

Gary welded grating installations cost less because you eliminate expensive alterations and piecing together on the job. Gary installations look better too. All members line up perfectly for that "tailor made" look. Cutouts and other details that take so much longer to do in the field are completely finished at the factory. Gary welded grating, designed for specific loads and deflections, is as easy to specify as it is to install.

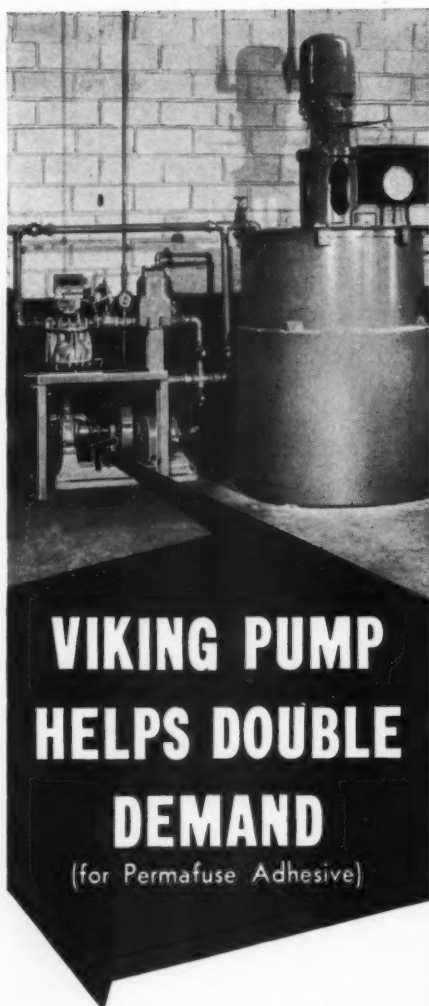
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Permafuse Corporation, Westbury, New York, manufactures adhesives for bonding brake linings to brake shoes. With only one Viking J-152 Pump, Permafuse has produced such high quality adhesive that demand has doubled. So they're adding a new heavy-duty Viking K-212 Pump that, with other equipment, will more than double production.

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See Our Catalog in Sweet's Industrial
Construction and Plant Engineer's File

himself open to criticism by his individual insurance department if he did not make an honest effort to secure this coverage in the domestic market. However, Lloyds having issued the policy would certainly honor any claim and give the full protection of the contract to the insured . . . While I grant you that I do not subscribe to an illegal method of placing this coverage or a circumvention of the method of the Surplus Line Law, I do believe that you have confused the issue by implying that there was no coverage under a Lloyds policy.

I would be very interested to learn the outcome of the present conflict regarding the National and State Group Plan and would also like to know who the third carrier is that you refer to in your article.

Morris Himmel, Secretary
Freedman, Olson & Scott Co., Inc.
Buffalo, N.Y.

• THE NEW FIRM SUPPLYING E&O INSURANCE TO CONSULTING ENGINEERS COUNCIL IS THE FIDELITY AND CASUALTY CO. (SEE "NEWS" ITEM P. 185; THIS ISSUE.)

CEC Objectives

Sir:

I was most interested in the article headed "Functional Unity" concerning Mr. A. C. Kirkwood of Kansas City, Missouri (Cover Personality, Oct. 1957).

I met Mr. Kirkwood in St. Louis in 1955 and feel he would be pleased with the scope of activities of Consulting Engineers Council since 1955. Recently, I have been preparing data for our 1957-58 yearbook indicating the objectives, duties, and 1957-58 projects of some 28 Consulting Engineers Council committees. Certainly these 28 committees cannot be tucked away somewhere in a functional group of NSPE and serve effectively.

There is a natural diversity of opinion among engineers on many matters. To dilute policies or programs arranged by those having these diverse opinions by having

such policies and programs comply as well with the wishes of engineers that are not in the consulting field would make progress very difficult.

NSPE does not and cannot perform the work of the 28 committees already devoted solely to the problems of consulting engineers. We need a representation with a single voice and a single purpose. Consulting engineers in Consulting Engineers Council are answering a clarion call — unmistakably intended for them.

The most encouraging sign of our times, however, is the sincere desire of engineers everywhere for cooperation and for "unity." This desire will permit the good efforts of functional groups, of Consulting Engineers Council, of all the societies, to assist the whole profession.

George W. Poulsen, Jr.
2nd Vice President
Consulting Engineers Council

Please Write Again

Sir:

Mr. Timmons and I have at present found employment in an architectural firm in Reno, Nevada (See Readers' Comment, Sept. 1957, p. 16). We feel that a background of architectural methods will be of great value in the consulting field. We plan to enter a consulting firm in the near future, after our service obligations are discharged, and for this reason we would like to get acquainted with those firms interested in our services.

Recently I checked with the Postmaster in Sparks, Nevada, and found that several replies had been sent to me addressed General Delivery. I failed to call for them and they were returned to the senders. This mistake has been corrected, so if those firms that replied will once more mail their information, I will give them prompt attention.

The replies that Harold and I have received thus far have greatly renewed our desire to

MORE THAN

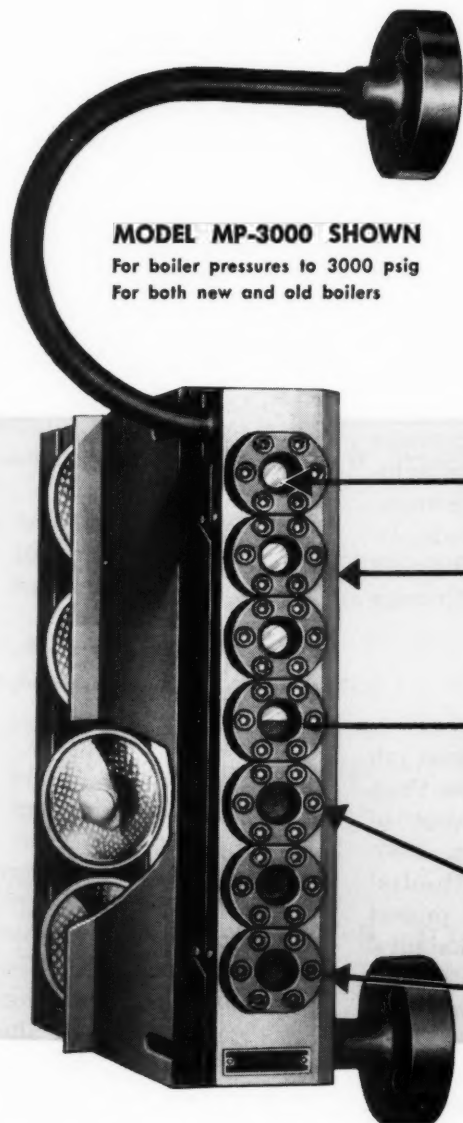
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DIAMOND MULTI-PORT GAUGES

In use and on order
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Generating Plants

MODEL MP-3000 SHOWN

For boiler pressures to 3000 psig
For both new and old boilers



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GAUGE NEVER REMOVED FROM BOILER FOR GASKET
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Also available
is Model MP-900
for boiler pressures
to 900 psig

Because the Diamond Multi-Port solves the problems inherent in water level gauges on boilers operating at high temperatures and pressures, it has had rapid and wide acceptance. In addition to the 1400 for central station generating plants, more than 150 have been sold to industrial power plants.

Advantages of the Multi-Port are many. In addition to those shown above, it has maximum thermal stability for rapid starting . . . "Hi-Lite" illuminator for improved readability . . . welded construction for permanent tightness . . . end stems can be furnished instead of flanges . . . startling reductions in maintenance costs.

Write for Bulletin 1174CE (Model MP-3000) or Bulletin 2044CE (Model MP-900) for more information.

7801

Diamond

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HOW TO GET AROUND TIME and COST FACTORS in Protecting Pipe Against Corrosion

When you are faced with the problem of protecting piping underground in highly corrosive soils, a high quality coal tar coating such as called for in AWWA Specifications C-203 and C-204 is normally hot applied at a pipe coating mill. However, in many cases, the volume of pipe does not warrant this expense or the coating mill is too far away to justify the time involved.

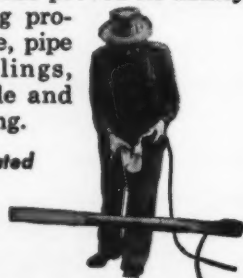
**That's WHEN Engineers
Specify TAPECOAT®
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hot-applied coal tar coating
in handy tape form**

Because TAPECOAT provides a coal tar coating equivalent in long-life protection to hot-applied coating at the mill, engineers are specifying this quality alternate material where time and cost factors preclude mill application.

This practical solution assures the protection required without the need for tar kettles, technical know-how and special crews. Field application costs are reduced because TAPECOAT is so easy to apply, using a torch to soften or bleed the pitch and then spirally wrapping it on the vulnerable surface.

TAPECOAT comes in handy rolls of 2", 3", 4", 6", 18" and 24" widths. Since 1941, it has proved its ability to give lasting protection to pipe, pipe joints, couplings, conduit, cable and insulated piping.

Write for illustrated
brochure.



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Company**

Originators
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Coal Tar
Coating in
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pursue consulting careers. Your assistance in this matter has been greatly appreciated.

Charles H. Handley
19 "K" Street
Sparks, Nevada

Toward Helping Relations

Sir:

We wonder if it would be possible to obtain a couple of dozen copies of your reprint on "How to Write Engineering Specifications." (July, p. 84.)

The Consulting Engineers Association of Georgia has a liaison committee with the Associated Plumbing Contractors of Georgia and we feel that proper distribution of some of these reprints would go a long way toward helping relations between the groups.

Oliver K. Lewis, Jr.
Consulting Engineer
Albany, Georgia

Wrong Architect

Sir:

We would like to correct an error appearing under "New Projects" in the October issue of CONSULTING ENGINEER (p. 188). The Farmington Methodist Church, a New Mexico project was credited to the architectural firm of Garland and Phillippi. Actually, the architects were McHugh & Hooker, Santa Fe.

J. L. Breese
J. L. Breese and Associates
Consulting Engineers
Santa Fe, N.M.

In a Word

Sir:

Mr. Ralph M. Westcott, President of the Consulting Engineers Association of Southern California, suggested that we write you and ask your assistance, through your columns, in clearing up a misunderstanding between our company and his profession through the usage of words.

We are the American subsidiary of a British company and, whilst

in the English language we use the same words, it would appear that there is a vast difference in the meaning between the United States and Great Britain.

We are the producers of ventilating equipment and, as every firm of repute will do, we maintain a technical staff to advise engineers on the suitability and application of our equipment.

When we first arrived in this country just over twelve months ago, we were told that the proper expression to describe this service in all our publicity was to state that we offered a free engineering service. This, in complete ignorance of the real meaning of the term, we proceeded to do with the quite now understandable reaction that we were frowned upon by the profession.

Mr. Westcott was good enough to call on us and find out exactly what we were doing and to explain to us how we should phrase it so that engineers in the United States would understand exactly what we are doing.

We would, therefore, like to make it clear that we are not offering a free engineering service in the sense it is used in this country but that we are producers of equipment with a staff technically qualified to advise on its suitability and application to any design problem of an engineer.

We have forthwith altered all our publicity but we would like to point out that one advertisement carrying this wrong-meaning phrase is in the Yellow Pages of the Southern California Trade Directory and cannot be erased until a new edition appears next summer.

If you, sir, would be good enough to let it be known that this misunderstanding has occurred in all good faith and that we have now done everything possible to put the matter right, we should indeed be grateful.

M. J. Beaney
Executive Vice President
Colt Ventilation of America, Inc.
Los Angeles, Calif.

CONSULTING ENGINEER

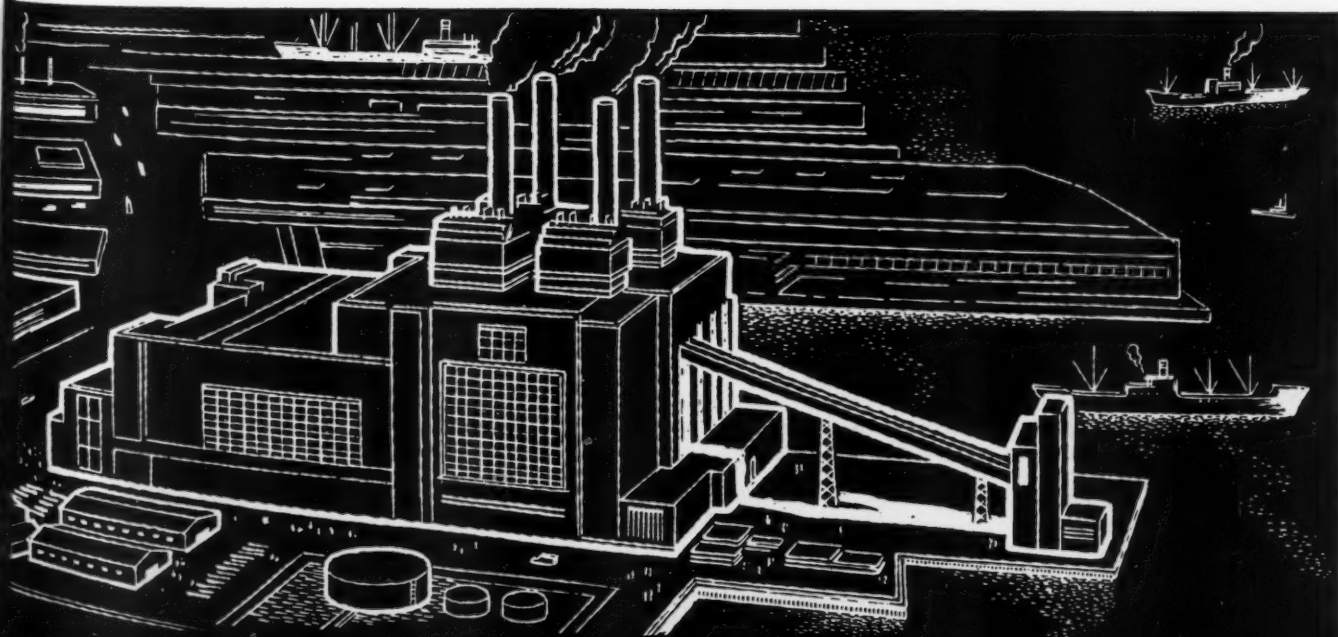
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SWITCHGEAR DIVISION**





Scraps & Shavings

IN THIS ISSUE of *CONSULTING ENGINEER* there is a special section of project reports on new schools. A study of the structural, mechanical, and electrical aspects of these projects will show that the engineers have done an excellent job. New schools have just about every currently conceivable design feature to make them ideal areas for instruction. Lighting levels are high and without glare; they have good heating and ventilation (and frequently cooling), so that comfort conditions are close to ideal. Some schools have closed circuit television making it possible to give instruction to many classes from one location.

We hardly need mention the money and space allotted to athletic and other recreational facilities. It is not unusual for as much as 90 percent of the site area to be given to athletics—including indoor swimming pools. Everything is provided except a pool parlor and a drag strip. If used to their fullest, these facilities should assure shapes like apes for all future Americans.

While rumblings of revolt have come from the taxpayers, few will deny that it is possible to give better instruction and that it is easier to learn in a modern school than it was in a school built 50 years ago. Good lighting, ideal comfort conditions, and well equipped playgrounds and gymnasiums all contribute greatly to an educational plant.

Those who object to the cost of the building are objecting to the wrong aspect of modern education. If generations past were well educated in cold, wet, one-room schoolhouses or in front of a fire in a log cabin, they received their education in spite of, not because of, poor facilities.

The criticism of parents and other taxpayers should be directed at the way in which these facilities are used, not at the facilities themselves. The designer of a fine automobile and the automobile itself are not the proper objects of adverse criticism if the driver fails to put gasoline in the tank or oil in the sump.

It takes more than a fine plant to make a fine

school. It takes a sound philosophy of education and intelligent instruction. The sturdiest structure and the finest facilities are only the stage. They do not make the play.

Our children are not being properly educated in the public schools or even in the state universities. A discouraged professor in the engineering department of a large midwestern school told us that just last month he gave a quiz in his class that was failed by two of fifteen third-year students. The quiz? Write the alphabet!

As horrible as this example sounds, it alone does not condemn completely our modern educational methods. The fact that two young men in a class of fifteen do not know the order of the alphabet does not mean that those same two are not proficient at calculus or thermodynamics. But it does indicate that something is wrong. Somewhere along the line, in their effort to acclimate each student to his environment and make him a useful member of society, the educators have failed to provide him with part of the basic information he needs to become a thinking being.

John Dewey was a great educator. He realized that education involves more than intellectual exercise. He saw the necessity for emotional adjustment of the child to his civilization. Some followers of Dewey misunderstood and took the extreme position that emotional adjustment is all that is necessary. These Dewey-eyed educators have all but given up intellectual instruction and have substituted the worship of emotional adjustment.

Those educators have given up one approach—and have failed at the other. The products of our schools are neither adjusted nor scholarly. Little Rock fiddles while Sputnik turns.

The educators have failed us. Their philosophy of education has failed. We must find a new way. You have designed and built the new schools. At this you have done well. Now, you must get busy in your own cities and towns and help build a new and better philosophy of education. ▲▲

Practical Data on Air Distribution

Prepared by the Engineering Department of Tuttle & Bailey, New Britain, Connecticut



Selecting the Throw

As a service to those responsible for specifying air distribution equipment, Tuttle & Bailey will publish a series of technical articles on this all-important phase of heating, ventilating, and air conditioning systems. It is hoped these articles will be of help to the newcomers in the field and serve as "refresher" information for others.

By definition, "throw" is the distance or radius in feet that an air stream travels from its point of discharge to a point at which a desired terminal velocity is reached. Determining the correct throw for an installation of ceiling diffusers or sidewall grilles and registers is a matter of careful analysis of job conditions and application of the following basic principles.

Ceiling Diffusers

The terminal velocities recommended below are necessary to provide satisfactory performance because of the rapid rate of temperature and energy equalization provided by the circular air pattern.

100 FPM Terminal Velocity

30 FPM Average Residual Velocity

Recommended where people are located adjacent to walls of structure for extended periods of time at sedentary occupations:

Private offices	Residences
Apartments	Hotel bedrooms
Hospitals, Private rooms, and Wards	

150 FPM Terminal Velocity

50 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure for extended periods of time:

General offices	Department stores	
Restaurants	Clothing stores	
Theaters	Operating rooms	Churches

200 FPM Terminal Velocity

70 FPM Average Residual Velocity

Recommended where people are not located adjacent to walls of structure at any time:

Industrial plants	Corridors
Process areas	

All other factors being equal, the use of different terminal velocities will affect the throw of a given size diffuser when handling a given CFM, and also the residual velocities in the occupied space. For example, if a diffuser with a 9' throw at 100 FPM terminal velocity is selected when the measured throw is 12', the remaining 3' will be properly conditioned although the terminal velocity at the 12' point will be lower than that originally chosen for the installation. The residual velocity will also be somewhat reduced. In cases where the measured throw is somewhat less than that provided by the selected diffuser, results will be satisfactory even though the terminal and residual velocities at the end of the measured throw will be higher than that originally selected.

Most diffusers are installed in rooms with ceiling heights of 8' to 12' and this variation will not affect diffuser selection. However, when ceiling heights are above 12', a corrected procedure should be used:

1. Measure distance from diffuser to nearest wall or opposing air stream.
2. Measure distance from ceiling to a point 12' from floor. Add to the distance in Step No. 1, 75% of the difference between the actual ceiling and the 12' height.
3. Use this value as the total throw and select diffuser for desired terminal velocity.

For installations with excessive ceiling heights, it is advisable to increase the CFM per diffuser and use fewer diffusers. For ceiling heights below 9', it is advisable to reduce the CFM per diffuser to a minimum and use more diffusers.

Grilles and Registers

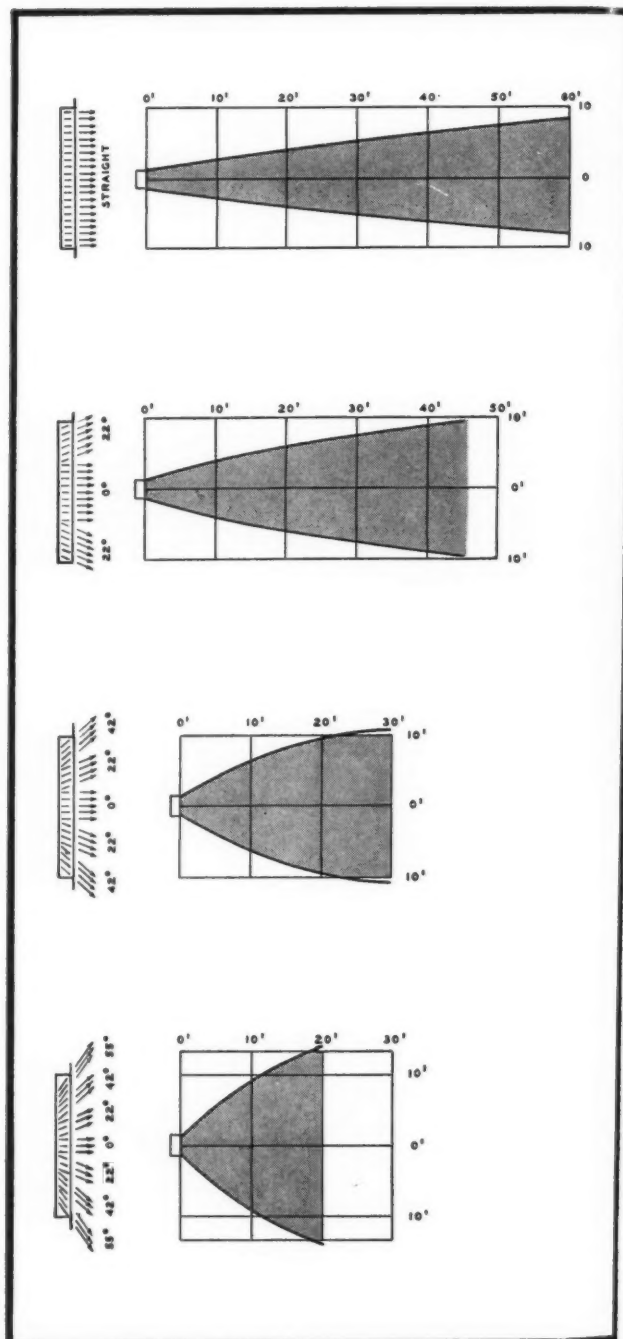
Unlike ceiling diffusers, grilles and registers have a comparatively low induction rate. The air stream moving in just one direction induces room air into the primary stream which means room air must be replaced by non-induced room air. This causes a counterflow residual air movement about equal to terminal velocity. As ideal residual air motion is 50 FPM or less, terminal velocity should not exceed 50 FPM and grilles should be sized on that basis.

When selecting grilles and registers, keep these points in mind:

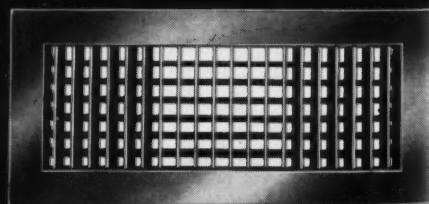
1. The throw from a straight-flow grille varies with the square root of the core area of the grille and with the face velocity.
2. The ratio of height to width has no appreciable effect on the distance of the throw from grilles where the ratio is less than 25:1.
3. If air streams from a grille are converged, it results only in reducing the effective area of the grille.
4. Breaking the air stream into jets has no effect on the rate of mixing or the throw.
5. Deflecting the air stream by turning the vanes outward to increase the spread, shortens the throw, depending on the degree of deflection.
6. The drop for a given throw varies about inversely as the face velocity for an air stream below room temperature and varies directly as the temperature differential.

In locating grilles, it is important to visualize the air patterns which various deflection settings produce. The patterns illustrated at right are based on a 24" x 6" grille. Grilles should be spaced so that edges of the streams from adjacent grilles do not meet before the stream has traversed over 50% of the required throw, otherwise undue turbulence in the occupied zone will result.

Air Patterns Produced by Typical Deflection Settings



If you have a specific problem involving air distribution, Tuttle & Bailey's Engineering Department will welcome the opportunity to be of help. Address: R. D. Tutt, Chief Engineer, Tuttle & Bailey, New Britain, Connecticut.



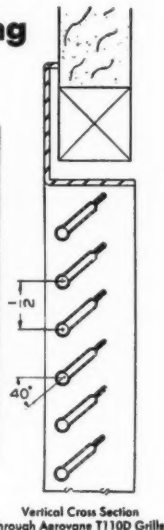
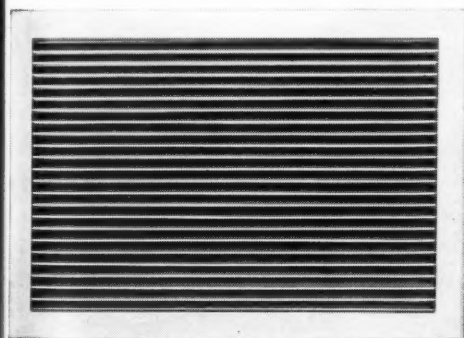
NEW PRODUCT NEWS from



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**return air grilles
and registers**

with 1/2-inch bar spacing

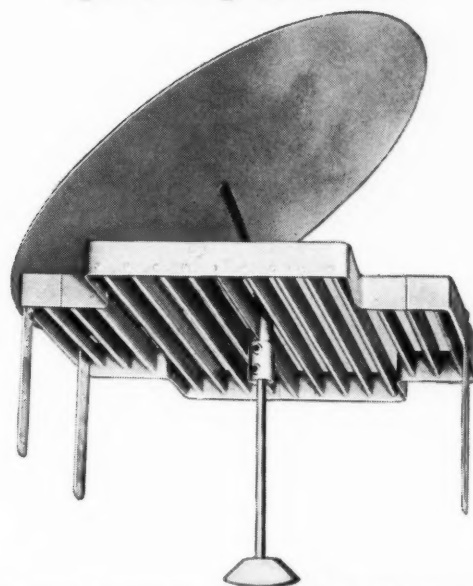


Vertical Cross Section
through Aerovane T110D Grille

This new design for the Aerovane line features horizontal bars set at an angle of 40° on 1/2-inch centers . . . a modern, streamlined appearance that virtually eliminates objectionable see-through. Aerovane T110D Grille is illustrated above . . . Aerovane T117D Register combines grille and adjustable opposed blade damper unit.

For full information, write for Bulletin 201.

**No. 6 Type TFD
volume control damper
insures positive,
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Designed for use with T&B AEROFUSE Ceiling Diffusers where short coupled connections are required. Unit consists of a single blade damper hinged to an adjustable bar grid. Damper setting is regulated through the face of the diffuser by means of an operator handle and rod which may be kept permanently in place or used as a removable key.

For full information, write for Bulletin 112.

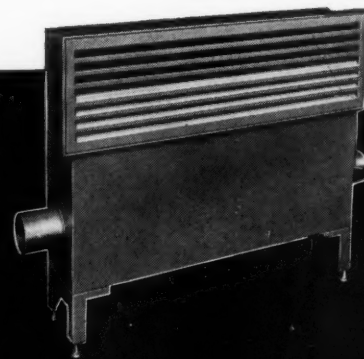
TUTTLE & BAILEY

division of Allied Thermal Corp.



New Britain, Connecticut

A complete line
air distribution equipment and accessories
for low and high pressure systems



The Word from Washington

EDGAR A. POE
Consulting Engineer Correspondent



LEADERSHIP and participation by the United States in the International Atomic Energy Agency, world organization for peaceful atomic energy uses, is expected to have a great influence on the vast program. There is strong hope and some belief that an international inspection and control system to divert atomic materials from weapons to peaceful purposes eventually will emerge from the far-flung agency. However, with Russia one of the 81 nations scheduled to aid in carrying out the treaty, official Washington has its fingers crossed.

MEMBERS of the Joint Atomic Energy Committee of Congress admit that they wrote into the Atomic Energy Commission authorization bill some money the AEC did not need at this time. But engineers and scientists all over the world will be keenly interested in the construction of a new plutonium recycle plant, costing up to \$15 million. Experts maintain that if there is ever to be cheap atomic power, methods for using plutonium as fuel in reactors must be developed fully. This experimental reactor will be a major research tool.

Two other projected reactors will be used for engineering study. One will be for the study of special nuclear materials. The other will be a natural uranium, graphite moderated, gas-cooled, power reactor. Britain last year began generating electricity from a gas-cooled, natural uranium fueled plant at Calder Hall. However, Congress is expecting the Atomic Energy Commission to come up with a much more modern reactor than Britain's. Representative Chet Holifield of California said the Calder Hall plant is now obsolete.

THE AEC says the best thing about the whole atom program is the isotope program. It has shipped 100,000 radioisotopes from Oak Ridge. There are more than 4000 users. These include 1717 in medicine, 1667 industrial firms, 263 colleges and universities, 327 Federal and State Laboratories, 69 foundations and institutions, and over 50 others.

"The atom has saved many more lives than it ever destroyed," said Senator Clinton P. Anderson of New Mexico, vice chairman of the Joint Committee on Atomic Energy. "Through the isotope pro-

gram it promises to bring about the wonders we have been talking about for so many years. It probably will pay the way for the entire atomic enterprise, weapons and all. We have only started in the isotope field."

The New Mexico Senator, one of the foremost authorities of the atomic program, said the total atomic program thus far has cost \$18 billion. He contends that the Federal outlay is now "returning us a half billion a year." Meantime, AEC Commissioner Willard F. Libby predicts that the savings in the atomic energy program within three years will have grown to \$5 billion a year.

A sharp scrap looms next year in the House of Representatives over the Senate-passed Tennessee Valley Authority bill which would permit the Government agency to have outstanding up to \$750 million of bonds in proposed expansion programs. There is already some renewed backstage maneuverings going on between public versus private power advocates.

PERHAPS there is no more reason to place consulting engineers under the Wage and Hour provisions of the Fair Labor Standards Act than to apply these to members of the legal profession. Attorneys are felt to be exempt, but the Department of Labor insists that consulting engineers come under the statute. (See page 132).

Engineering societies in the Western States will have an opportunity to express their positions on this soon before a House Education and Labor Subcommittee, headed by Representative James Roosevelt. Engineers should communicate with the Clerk of the House Committee, Washington, D.C. for permission to appear and present their stands. Hearings will start at Denver, October 31, and continue through most of November at various cities in Washington, Oregon, California, and Nevada.

Bills that would amend and broaden the Wage and Hour Act are pending before the House and Senate Labor Committees. The measures will come up for further committee consideration early next year. The National Society of Professional Engineers has proposed formally that Congress ex-



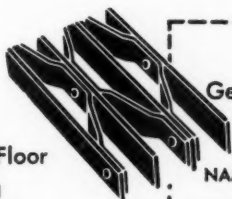
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Lumens; other technical data on Flush Lens Units, Downlights, Picture and Accent Lighting, Wall Washers, etc.



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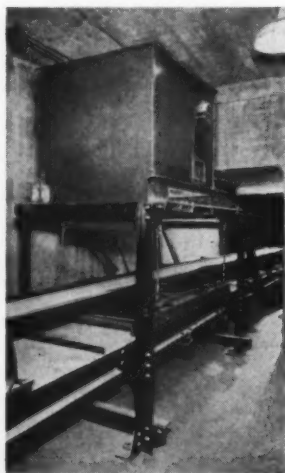
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*Reg. U. S. Pat. Off.

Bulletin 375 on request

MERRICK SCALE MFG. CO.

PASSAIC

NEW JERSEY

pressly exclude firms rendering professional services from the Act's coverage.

The Department of Labor instead favors extension of the Act. Its actions follow the pattern of Federal agencies and bureaus to build bigger, more powerful bureaucracies, and thus bring more and more people under their jurisdiction. When their powers become greater, the agency has a greater voice plus more lucrative jobs.

THE Public Health Service has begun allocating to states some of the \$45 million of funds appropriated by Congress as matching funds for construction of sewage treatment plants.

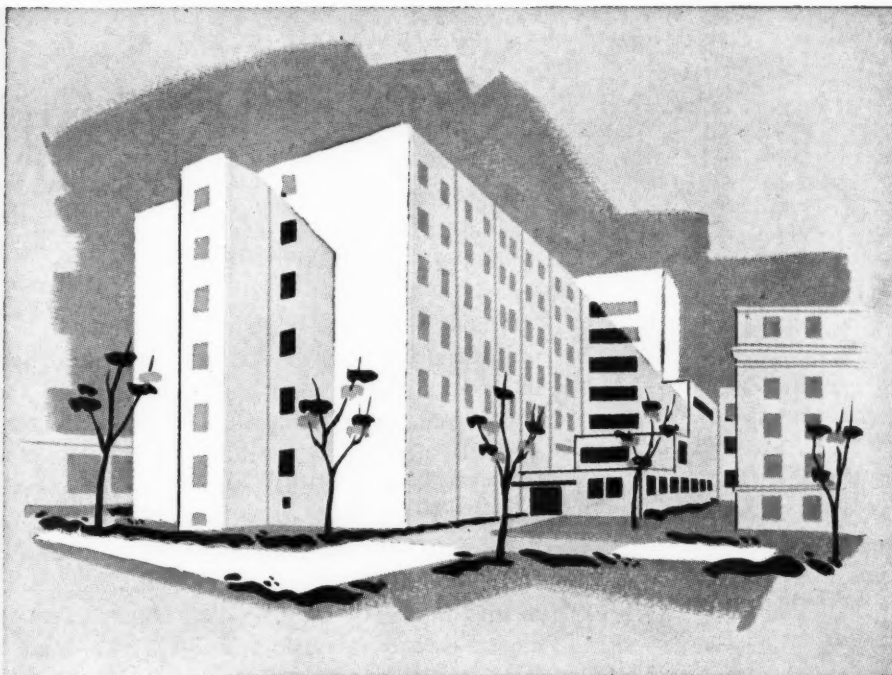
CONGRESS provided some large sums for public construction during the current fiscal year, and the various departments have begun spending it. A total of \$858 million was provided for public works, rivers, and harbors. About \$634 million of this will be spent under jurisdiction of the Army Corps of Engineers for rivers and harbors. The military construction bill provided the Army with \$365 million, Navy \$265 million, and the Air Force \$900 million. Plant construction and acquisition for the Atomic Energy Commission will exceed \$400 million.

CONGRESS is expected to pass a large public works authorization bill next year. The bill was approved in the Senate, but the House failed to call it up in the closing days of the session.

AT the direction of a special House investigating committee, Army Engineers at Columbus, Miss., have begun testing of asphalt paved airstrips comparing them with concrete strips. Testimony before the committee showed that repetitious channeled traffic by heavily loaded bombers had caused breakdowns on taxiways and runways. Meanwhile, the House committee interim reports says there is a dispute between the Army Engineers and the Air Force pertaining to the qualities of the two materials.

THE World Bank recently issued its Twelfth Annual Report. During the year the Bank made 20 loans (\$388 million) in 15 countries. Since its founding in 1956, the bank has loaned more than \$3,100 million in 170 loans to 45 countries. Last year the Bank continued to loan mainly for basic services that stimulated economic growth. Loans were for power plants, public works, and agricultural programs. Industrial projects received \$95 million. The Bank is providing technical assistance where needed. Many missions are headed by consulting engineers engaged by the Bank for special projects. These engineers not only advise the borrower but report to the Bank as to the soundness of the undertaking.

boilers are hospital



Architects sketch of new Sparrow Hospital.

Architects: O. J. Munson Associates—Lansing, Michigan.

Professional Engineers: E. Roger Hewitt Associates, Inc.—Lansing, Michigan.

One of the most important considerations in hospital construction specifications is the steam generation system, because it must give around-the-clock reliability without failure. It is significant, then, that for the Edward W. Sparrow Hospital in Lansing, Michigan, two Wickes shop-assembled Type-A Steam Generators have been installed to provide a dependable source of heat. The new units, which are housed in a completely new boiler house, replace the original Wickes coal fired boilers. Each of these two new boilers are capable of producing 18,500 lbs. of steam per hour at an operating pressure of 125 psi. They provide 2250 square feet of heating surface and are equipped with fully automatic Wickes combination oil and gas burners. These units have a design pressure of 160 psi.

Write for our Catalog 56-1 for detailed information on Wickes Type-A Boilers, and we will also include our Bulletin 55-1 covering the complete line of Wickes Products and Facilities.



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School Engineering

"School Engineering" is the subject of a special series of project reports published this month. As any engineer who has undertaken a school project in recent years knows, schools are no longer a collection of classrooms surrounding an auditorium. Instead they are complicated plants involving difficult structural, mechanical, and electrical design problems. No longer is the mechanical design confined to a little plumbing and a low pressure heating boiler. Today, the mechanical work frequently involves an indoor swimming pool (supplied with treated and heated water) and all the equipment required for summer and winter air-conditioning. Electrical work means not only lighting but communications systems, alarm systems, and closed circuit television. To give you some idea of how several engineering firms have approached these problems, we have published, starting on page 87, a special report showing five actual projects—plus a thoughtful introduction, by Harry Terry, lately of New York City, now of Trenton. For some comments on schools and schooling from quite a different viewpoint, see "Scraps and Shavings," on page 24.

Since it is well known to every consulting engineer that there are many high and low ranking public officials here in the United States who have only the vaguest idea of what a consulting engineer is or how he operates, it should come as no surprise that politicians and political appointees in Bolivia, Ceylon, and Saudi Arabia, for example, are not always fully aware of the subtleties of private practice. Most responsible officials in the less industrially developed countries are intelligent men, but they are not familiar with the proper way to secure professional services, and they do not understand the relationship of the engineer to the architect, the contractor, the supplier, or the client. Before entering into an agreement with either public or private clients in foreign countries, the consulting engineer should know what kind of contract to prepare and what explanations to give. A consulting engineer who has had plenty of experience in foreign work, Richard D. Harza, has written an article for us (page 108) that will give you a good idea of what you should do when you go after a foreign project. Following his suggestions can save time and money, and avoid misunderstandings.

Foreign Relations

And a Carpet on the Floor

When a consulting engineer becomes established as a professional practitioner and his stature rises in the eyes of his clients, he may become conscious of the need for an office befitting his position in the structure of society. Or one day he may just notice that his quarters are crummy. Either way, he will want new offices, and he will want them properly decorated. The minute he decides to move or to redecorate the old office, he should not hesitate. He should reach for the telephone and call a decorator. The worst thing he could do is to tell his wife, his wife's friend, or his friend's wife. If he does that, all is lost. Psychologists have never found out why, but every female even remotely connected with a remodeling job is automatically an expert decorator. Start to redecorate, and women you would never suspect of having opinions on anything suddenly turn out to be professional arbiters of good taste. So, if you are going to decorate your office, first take a look at the article, "Decorating an Office for an Engineer," on page 84, then pick up your telephone. Dial a decorator. Tell your wife *after* the job is done.

Every Frenchman is a philosopher. It does not matter how he earns his living — green grocer or General of the Army — he is first a philosopher. That was never better demonstrated than by the little piece, "Comments from France," published this month on page 141. Fernand Ernstein, the author, is an electrical engineer — and a good one. He is a member and officer of the French Association of Consulting Engineers, and he is active in the high echelons of the International Federation of Consulting Engineers. The comments he has put down for us represent his concept of a philosophy of professionalism. He has come up with an excellent teleological definition of engineering as a profession. Yet Ernstein's approach is Cartesian, as every good engineer's should be.

Vraiment Philosophe

Designed For You

A year ago in May, a number of consulting engineers from this country met and talked with Fernand Ernstein and several of his colleagues. The French Association of Consulting Engineers arranged an excellent luncheon meeting in Paris for the members of that year's Consulting Engineer's European Tour. Plans are now being made for another Tour this coming May. Again a group of American engineers in private practice will have an opportunity to talk with their European contemporaries. You could be one of those American engineers. If you are interested, read "A European Tour Designed for You," on page 105.

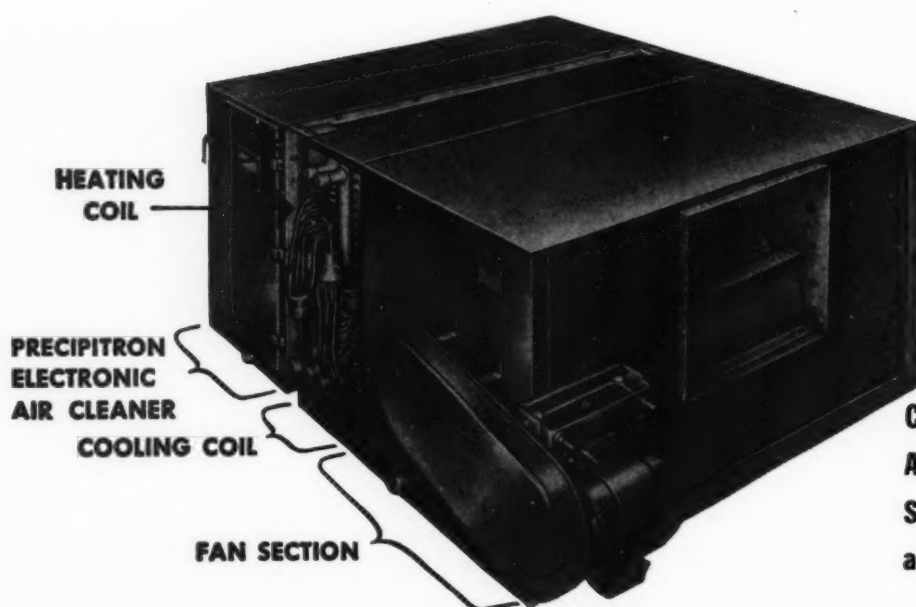
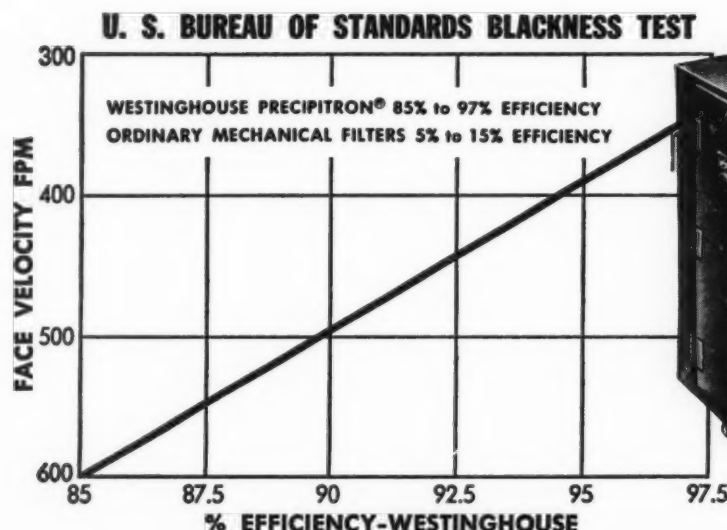
Unfortunately, interpretation of the law does not seem to be as simple as most of us think it is. Present to any engineer a synopsis of a law case, and he can whip back a decision just like that. For some reason lawyers are not so good at giving quick, simple answers. They are always looking at it this way and then that way, and they are always bringing in extraneous decisions and mixing everything up. For example, it is perfectly clear to any reasonable consulting engineer that the Department of Labor boys who go around checking up on Wage and Hour affairs have absolutely no right to apply their regulations to a consulting engineer firm. It states clearly in the Law that it has to do only with commerce — interstate commerce, in fact. Now, everybody knows that engineers in private practice are not engaged in commerce. They deal in professional services. Nowhere in the law does it say anything about these regulations applying to professional men who deal in services. So, there you are! Lawyers just cannot see how simple it is. So we got a lawyer to analyze the Wage and Hour sections of the Fair Labor Standards Act, as they apply to consulting engineers. True enough, just like a lawyer, he said it was not as simple as it seemed. He said maybe consulting engineers did come under the Act — and then again, maybe they did not. And unfortunately, it looks as though he is right. Mr. Edward Kenney has written an excellent analysis of this law, and after reading his article ("Wages and Hours — Consulting Engineers vs. Secretary of Labor," page 132) you will have a better concept of how you stand. It is none too good, but you might as well know the facts and face them. And it is not hopeless. There is always "the glorious uncertainty of law."

Wages and Hours

How Tall Is a Tree?

The tall timbers of the great Northwest make an attractive setting for nature lovers and lumberjacks, but they are nothing but trouble for aerial surveyors. It is possible to survey land and prepare accurate contour maps from photographs taken from the air, but if there are areas of tall forest in the photograph, it is not the level of the ground but the level of the tree tops that is established. Then, to plot the ground elevation, you must know the heights of the trees. To straighten things out it is necessary to send in a field party and get some data with feet planted firmly on the ground. Kendall B. Wood has found that this combination air-ground method gives good results. The way in which his firm worked out the procedure to be used to combine aerial photogrammetry with field notes is explained in "Aerial Surveying of Wooded Areas." It starts on page 116.

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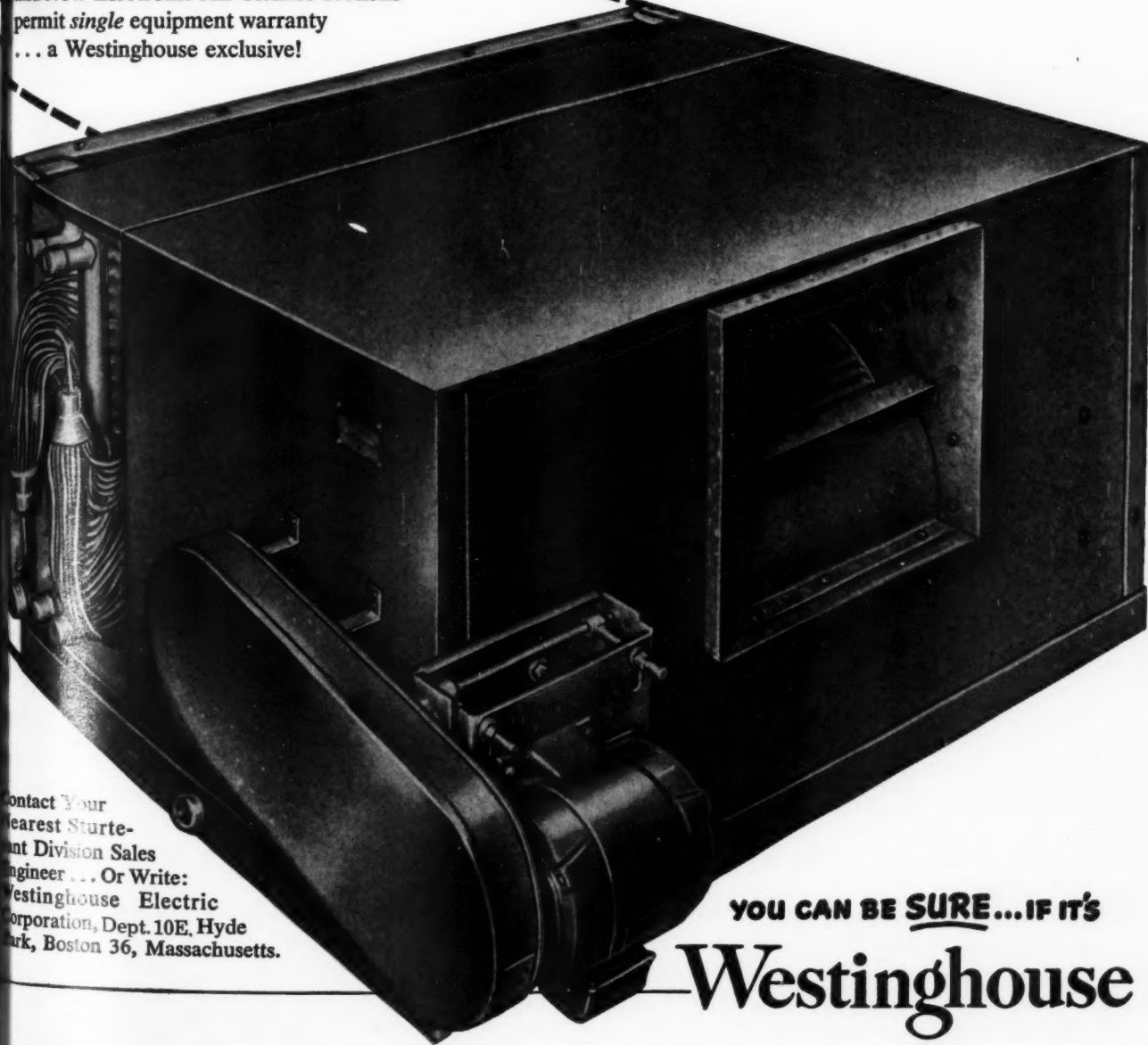
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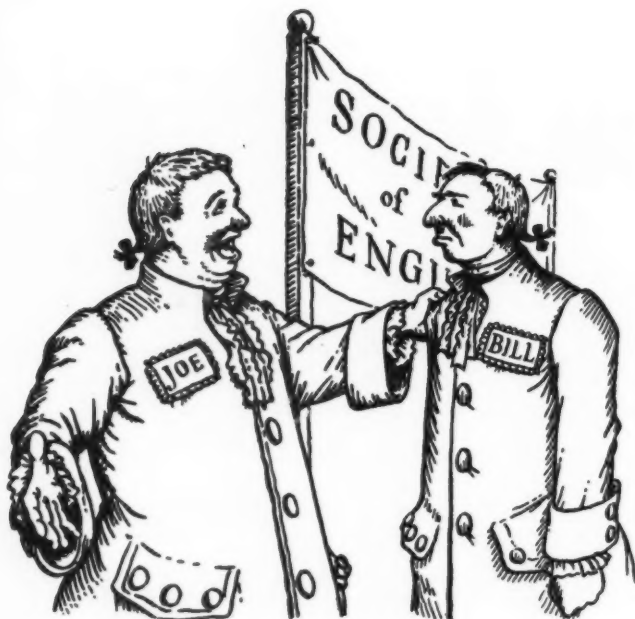
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STAFF

A bill providing for mandatory registration of professional engineers and land surveyors was left in committee when the 1957 session of the Massachusetts General Court adjourned for the year. The act had been drafted by a joint American Society of Civil Engineers—Boston Society of Civil Engineers committee. The bill would have changed the present permissive registration law to a mandatory law and also would have established an engineer-in-training program.

Earlier this year, the bill had been approved by both the Senate and the House. The governor, at the request of a number of organizations, returned the bill to the senate with a request for amendments. The senate concurred in the amendments, but the house did not.

Frank L. Heaney, chairman of the joint ASCE-BSCE committee, said the measure, if passed, would have brought Massachusetts up to the level of the other 47 states, all of which now have mandatory registration laws.

The bill will be resubmitted in the 1958 session.

Engineers Joint Council has "tabled without prejudice" the application of the Consulting Engineers Council for participating membership. The EJC Membership Committee had recommended that their board consider CEC's application for affiliate membership, and pointed out that CEC meets all constitutional requirements.

However, the committee also brought to the attention of the board the clause in the the CEC constitution that states:

"Incidental to the accomplishments of the foregoing purposes, to advise and recommend the enactment of legislation on a national basis in the interest of the public and the independent consulting engineer, and to oppose all legislation that is discriminatory or inimical thereto, and to assist the

members comprising the council in state or local matters that may have a bearing on the general interests of the council."

This clause was considered important to EJC because of the effect it might have on their tax classification. EJC at this time is preparing to make application for incorporation in New York State and hopes a new and lower tax classification can be obtained. Having as a member an association interested in lobbying might endanger the low tax class they are seeking.

The CEC has applied for incorporation in Louisiana, and its tax status is currently a moot question.

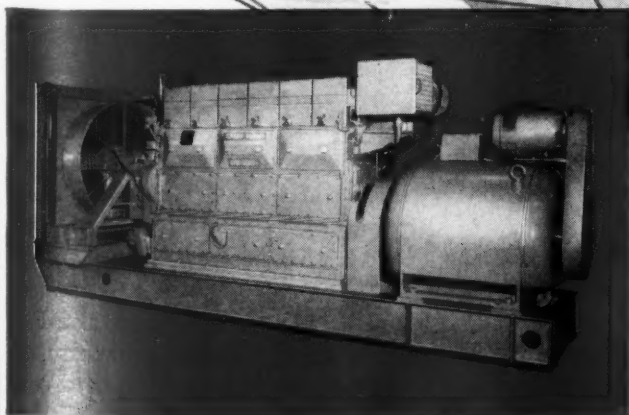
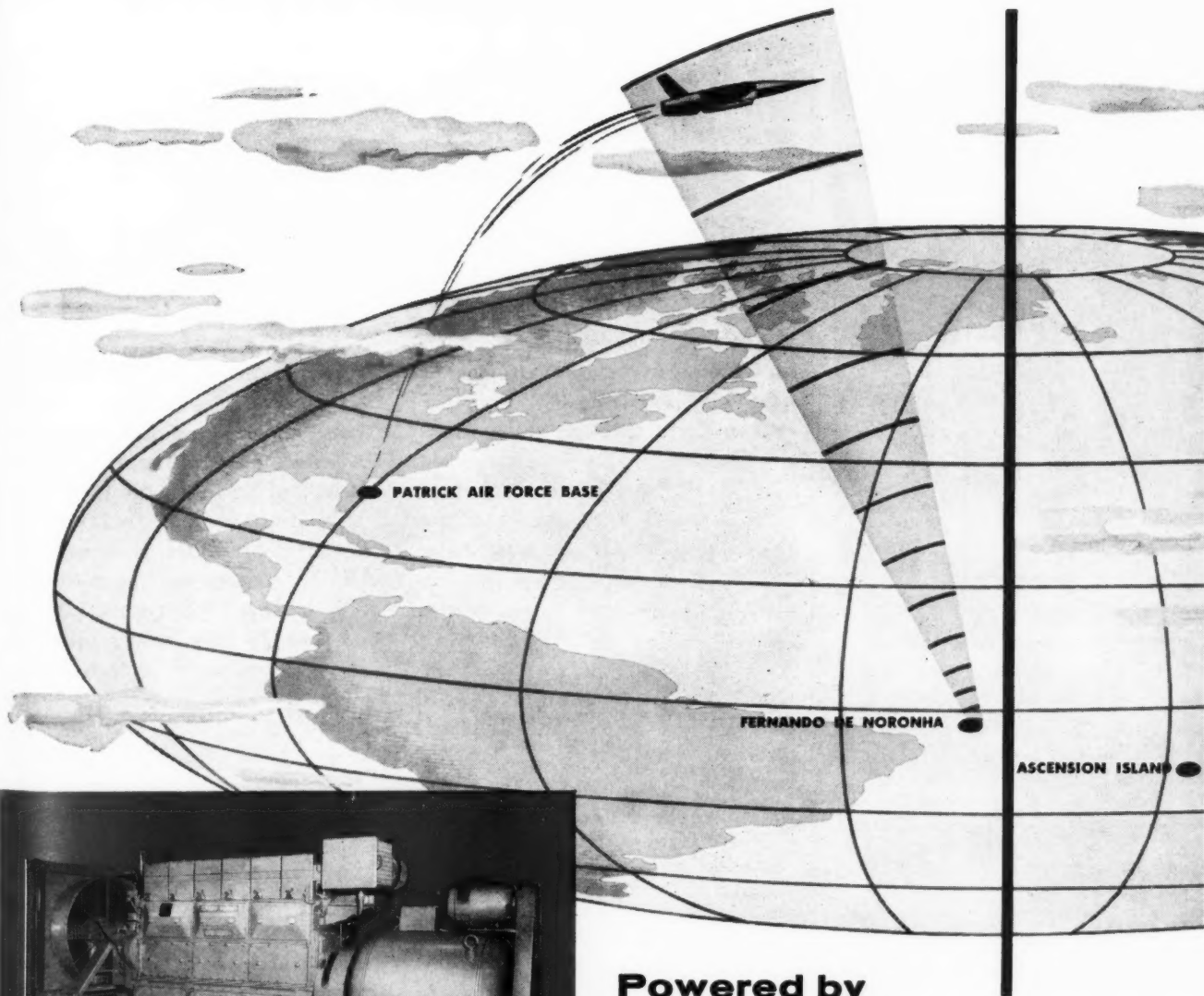
The EJC made it clear that the tabling of the CEC request for membership is only a temporary measure—until the corporate and tax statuses of both organizations are settled.

The CEC constitution is being revised, but no mention has been made of any intent to revise the "lobbying" clause.

The ASCE tried something new—and profitable—at its annual meeting in New York last month. Commercial exhibitors were allowed for the first time. All 31 spaces were applied for, almost before the announcement was made public.

The New York Association of Consulting Engineers' employees' pool is being used extensively by members. The records show that a majority of the calls are from some consultant who wants to place an employee with another firm temporarily. As a rule, the smaller firms place the men, the larger ones absorb them. One consultant even went to the trouble to get evening and Saturday work for some of his men through the pool.

The New York Association acts as a clearing house. When a call is received from a consultant who has an employee to place, the request is given



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priority over other work in the association office. The temporary employer pays the permanent employer an amount equal to the employee's regular salary. An additional 25 percent is added to cover taxes and bookkeeping costs. The employee receives his paycheck from his permanent employer on his normal payday.

And of course, it is understood that temporary employers do not offer permanent jobs to employees obtained through the pool.

The American Society of Mechanical Engineers and the American Rocket Society have exchanged representatives on governing boards. Although the persons sitting in on the meetings will take part in discussions, they will not have voting privileges. Eugene W. Jacobson represents ASME on the ARS board, while Robertson Youngquist fills the corresponding role on ASME's board on technology. The ARS is an ASME affiliate.

A number of changes — including the elimination, creation, and shifting of responsibility — on committees were discussed at the last Consulting Engineer Council board meeting. Some of these changes were attributable to CEC now having a full-time secretary who can handle a number of the matters formerly delegated to committees. Some groups, which had accomplished their purposes, were disbanded.

John K. M. Pryke, first president of the CEC, was asked to take charge of all joint committees as they now exist.

After more than two years of work, Engineers Joint Council has compiled its first manual of consulting engineering practice, which now is being distributed to member societies. The manual, prepared by an EJC task committee which included Consulting Engineers Council and National Society of Professional Engineers representatives by in-

itation, is titled "The Practice of Consulting Engineering." It is based on background material provided by several EJC member societies.

The report is being distributed with the understanding that individual member groups can add or delete material as they see fit. Counselor in the preparation of the EJC report was William A. Shoudy, who was instrumental in the preparation of the ASME "Manual of Consulting Practice for Mechanical Engineers." The Canons of Ethics in the EJC manual is the same as that used in the ASME manual. However, the ASME credited the canons to the ECPD. The EJC report pointed out that the canons was prepared by the American Engineering Council, and later developed and promulgated by the ECPD.

For initial distribution, EJC had 1000 copies printed. EJC is keeping 300 of these, and distributing the remainder.

The executive committee of the Consulting Engineers Council has approved, subject to confirmation by the Board of Directors, the change-over of group errors and omissions insurance from Lloyds of London to the Fidelity and Casualty Company, a member of the American Fore Group. The new policy will be handled by H. C. Hauth Co., Inc., of New York City.

In September, the Hauth Co. announced that it no longer represented Lloyds on errors and omissions policies (see "Errors and Omissions," September, page 82). After Continental Casualty Co. had come out with an errors and omissions policy, brokers in many states were unable to issue Lloyds policies because of state "surplus line laws" prohibiting the sale of insurance underwritten by foreign companies when similar insurance was available from domestic firms.

The H. C. Hauth Co. also handles a group E&O policy for the American Institute of Con-



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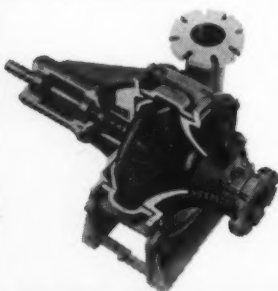
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sulting Engineers, but a company spokesman stated that the Institute had not yet decided whether they would change to the new Fidelity & Casualty policy or find some other solution.

The ASME annual meeting will be the largest meeting ever sponsored by the Society. With headquarters in the Statler and Sheraton-McAlpin hotels, the six days of sessions (Dec. 1-6) will include the presentation of over 250 papers. From 12 to 15 sessions will be held simultaneously.

Concurrent with these sessions will be the annual meeting of the American Rocket Society.

The Consulting Engineers Council now has an insignia. At the executive board meeting, it was agreed to have the most popular of two designs under consideration completed by a commercial artist. The insignia will be used on Council stationery and publications, and will be available for use by Member Associations.

Engineers Joint Council has authorized counsel to obtain permission from New York State to incorporate. After the permission is received, the proposal will be put to EJC member organizations for approval. If it is decided to incorporate, EJC will dissolve, then immediately reorganize as a corporation.

In line with the plan to incorporate, the EJC board also approved a revised statement of purposes. The new statement is, substantially, the same as the suggested revisions discussed in this column in October. This revised statement of purposes will be adopted, however, only if EJC does incorporate.

Peter J. Apol, American Institute of Mining Engineers business manager and consulting treasurer, has been named to head a committee to investigate the possibilities of combining some office functions for societies

centered in the new United Engineering Headquarters. Strictly in the discussion stage is the establishment of an office which would provide secretarial help to the various organizations as needed. The individual societies then would be billed for the service.

Apol also is looking into the possibilities of a central mail dispatching and receiving station. He was asked to consider only the practicality of handling bulk mailings. It is felt that too much bookkeeping would be involved in unified handling of first class mailings for the groups.

An extension of time has been granted by the EJC and ECPD to the Columbia University's Bureau of Applied Social Research in connection with the setting up of a procedure for conducting a comprehensive survey of the entire engineering profession. A report had been requested in September. Now the report is to be submitted in December.—Additional experts in engineering aspects of the study have been assigned to assist the Bureau.

The EJC and ECPD have been granted a fund of \$50,000 by member societies to begin work on the survey.

Suggestions of members were incorporated into a board recommendation that ASCE membership grades be renamed. The change will require a referendum. At present, the three ASCE membership grades are, Junior, Associate, and Member. The recommended changes would establish Associate Member, Member, and Senior Member grades.

A number of persons have objected to the Junior member grade. The way the membership requirements were set up, an engineer could be classified as Junior until he was 32 years old. Transfer to another classification was mandatory at that age. With veterans attending college after they served in the armed forces,



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it sometimes had proved difficult for them to acquire the requisite years of experience required for full membership by the time they were 32.

Under the new grade system, the ASCE requirements would make transfer to another grade mandatory only after an engineer has been out of college for 12 years. The new classifications also would require a senior member to be registered. Minimum age for senior membership would be 40 years of age.

Corporate practice has been much in the NSPE forefront this season. It was chosen as the topic of discussion at a district meeting of NSPE representatives and also was among the main areas of discussion at an NYSSPE board meeting.

The NSPE Northeastern District, meeting in New York City, heard discussions both pro and con. It was emphasized that the meeting was not an attempt to solve the recurring corporate problem in New York State, and speakers pointed out that the viewpoints they expressed were their own, not that of any organization or of their employers.

Object of the meeting was not to come to a conclusion about the practice of engineering through corporations but merely to exchange information.

F. H. Zurmuhlen, Commissioner of New York City's Department of Public Works, pointed out that the purpose of any law is to protect the public, not to advance the economic objectives of any person or profession. He said professional competency is peculiar to an individual, while corporations are motivated by business practices and governed by the ethics of the market place.

Could an engineer and a board member, who is hired by a corporation, act with the same freedom of decision as an engineer in private practice?, Zurmuhlen asked. And yet, he pointed out that the penalties for any legal

liability would fall on the individual engineer, who would not be a free agent but would be acting on behalf of his corporate employer.

"A relatively few corporations and individuals who would profit under corporate practice are the ones who are pushing the matter in this state," he concluded.

Dr. William J. Ryan, president of the ASME and a vice president of Stone & Webster Engineering Corp., called the whole matter of corporate practice a "legal fiction." Practicing engineering through a corporation is an entirely different matter from the practice of engineering by a corporation, and Dr. Ryan said he wished the lawmakers would get their terminology right.

"A corporation cannot go to college, take an examination, or practice engineering. Despite this fact, the clause of corporate practice is imbedded in the laws of 35 states," Dr. Ryan continued. "And facts cannot stand up against legal fiction in the laws."

Dr. Ryan said he practices engineering for, and on behalf of, a corporation. "How does it safeguard the public to require me to go into business for myself before I design a power plant?", he asked. "Should laws be adopted that would stop me, and thousands like me, from practicing my profession?"

The New York State Society of Professional Engineers, at a recent board meeting, decided to conduct a referendum to see what the members think of the practice of engineering through corporations. The report of a joint professional committee for the study of the education law is to be mailed to all New York members. They will be asked to vote in favor of the section that, in effect, asks that New York State's law be left as it is, or for the section that would allow carefully controlled corporate practice.

If a member votes to leave the New York laws unchanged, he also will be asked to vote on two

CONSULTING ENGINEER

How a year in the Antarctic proved that USS "T-1" Steel "can really take it"

THE SKIS on these gigantic 10½-ton sleds are made of USS "T-1" Steel. Over a year ago, 38 of the sleds went into service as cargo carriers for the Navy's OPERATION DEEP FREEZE in Antarctica. During that time they have been subjected to temperatures around 69° below zero. Towed by powerful tractors, they have scraped and gouged—400 miles in a single trip—across the rock-hard ice of the South Polar Plateau. And each sled has carried up to 20 tons of cargo per trip.

What has been the effect of this severe service on the skis of USS "T-1" Steel? None. They have remained strong and tough, despite the bitter sub-zero temperatures. No brittleness. No failure. USS "T-1" Steel's hardness has successfully resisted the tremendous abrasive properties of crusted snow and ice. Its toughness has prevented low-temperature impact failure. What's more, its very high yield strength (90,000 psi minimum) permitted the skis to be fabricated from ¼" USS "T-1" Steel plate. Thus, the skis were built *lighter, yet stronger*.

The USS "T-1" Steel skis are 154 inches long and 34 inches wide, were cold-formed on a brake press in the shape of troughs. Then the front and back ends of the troughs were notched at the outer line by gas cutting, formed up and together, then welded to make the curved front and back ends of the skis. Welding was done with E-12015 rod.

USS "T-1" Steel is being used to increase strength and durability, while reducing weight and costs in a wide variety of applications from bridge construction to mining equipment. For complete information, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



Sleds being assembled at landing point in Antarctica. The massive sleds were designed jointly by the U. S. Navy and Otaco, Limited, of Orillia, Ontario, Canada.

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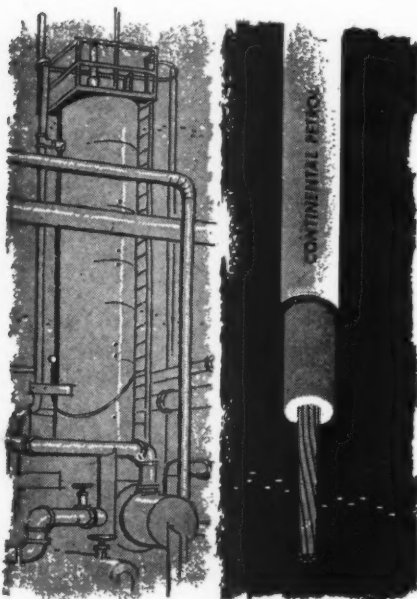
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other modifications of the existing laws. One change would substitute the words "professional engineering" where the law now reads "design or supervision as principal" in regards to the work on which an engineer or land surveyor is in responsible charge. The other change would add the work "manufactured" in several places in the construction of the article on corporations.

The two changes assure the NYSSPE that at least they will go to the legislature with some constructive suggestions, even if the members vote not to change the existing statutes basically.

Also at the NYSSPE board meeting, Theodore J. Kauffield, chairman of the insurance committee, pointed out the advantages of the Continental Casualty Company Errors and Omission policies being endorsed by the society:

¶ The Continental policy is retroactive, and will cover any period in which the insured had a policy with another firm.

¶ An engineer is covered for 12 months after he lets his policy lapse, if he pays a reduced premium for such extension.

¶ The premium rates are worked out for each policy holder taking into consideration the types of work in which he specializes.

Kauffield said his committee, after a long study, found Continental Casualty policies more economical than others offered.

Among the primary topics of discussion at the NSPE fall meeting, in Bismarck, N. D., last month were the program for young engineers (considered one of the weakest links in the NSPE program) and the AIEE proposal for unity.

Although the technical training of young engineers is considered excellent, the youths are not receiving all of the training in the professional aspects of engineering that the NSPE considers desirable. The NSPE makes it clear that it does not intend to go out

and organize student chapters. However, it was recommended that the national organization recognize and provide professional guidance through printed material for some student groups that are working through the NSPE state societies.

In order to be recognized by the NSPE, the student groups would have to meet a number of requirements such as faculty sponsorship, acceptance by the dean of engineering, affiliation with an accredited school, and working through state chapters.

Accent in the unity discussions was on the possibilities that NSPE in the future might become affiliated with groups that include nonregistered engineers. The Bismarck meeting was the first opportunity NSPE has had to discuss the AIEE unity proposal. It was presented to the NSPE membership in the July issue of *American Engineer*.

The American Standards Association and the ASME have approved four sections of a manual on drawings and drafting practices. It is to be published by the ASME. The new standards and those to follow will represent a common written language for engineers in all branches of the profession, according to Col. Clarence E. Davies, ASME secretary. The sections approved concern size and format, line conventions, sectioning and lettering, pictorial drawings, dimensioning, and notes.

Participating in the project were 23 national organizations.

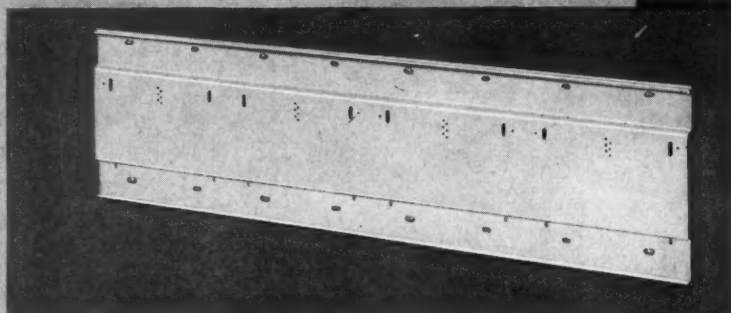
Newest member of Consulting

Engineers Council is the Cincinnati Association of Consulting Engineers, bringing the total number of member organizations to 18. CACE is made up of 35 individual members, representing 16 firms. Albert F. Ruehlman, of Beineke and Ruehlman, is president and director; W. V. McAllister is secretary; treasurer is E. Larson. ▲▲

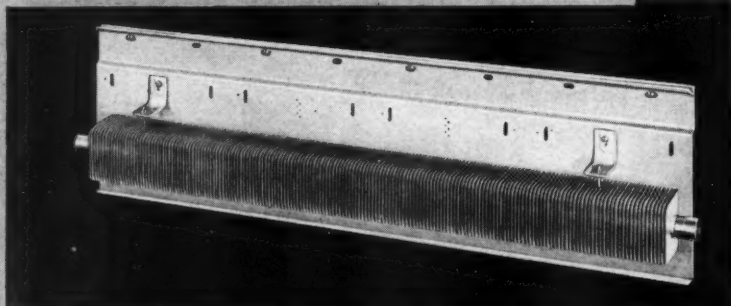
CONSULTING ENGINEER

installing nesbitt sill-line... easy as

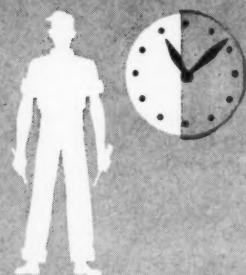
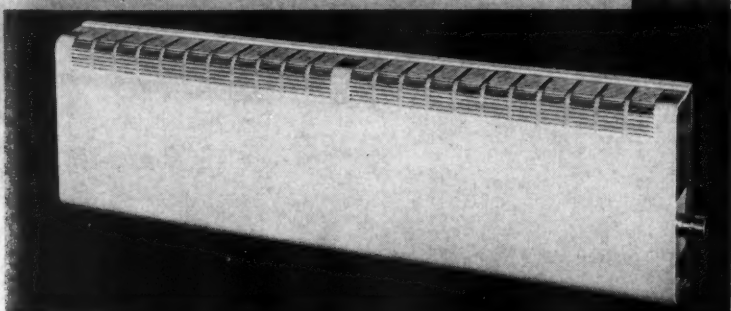
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2



3



Erect the back panel. It is one true and rigid piece, formed of 20-gauge steel. It fastens to the wall or studding with a few screws and aligns perfectly when butted to other sections. With seven lengths — 2 to 8 ft. — and sleeves, you may fit any wall to wall without cutting.

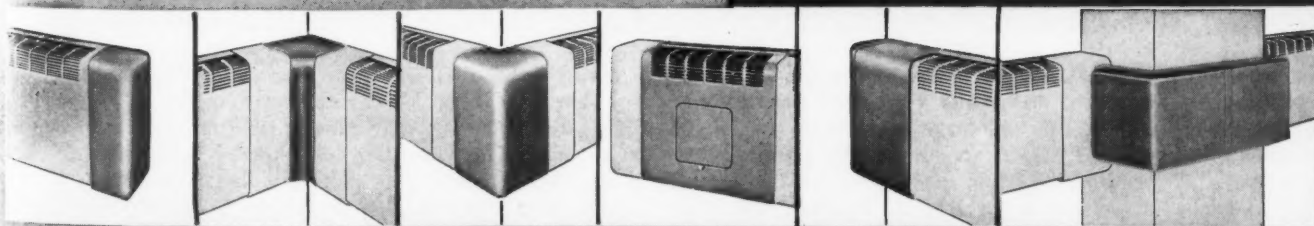
Suspend the heating element. There are eight types, with corrugated aluminum fins, offering a wide range of capacities, steam or hot water. The copper tube ends are sized-to-mate for easy sweat jointing, and the adjustable hanger brackets provide for pitch and expansion.

Mount the front enclosure. The die-formed 16-gauge front locks into back panel for full length support at top and bottom. Other accessories are added. One, two, three — and the world's most beautiful perimeter radiation is ready to bring comfort with economy to modern interiors.

Sill-line has every needed accessory for finishing short of wall, wall to wall, or around corners and columns. Ask for Publication 102.

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New Distribution Switchboard is easier to



The new standardized switchboard accepts any combination of seven different types of protective devices: G-E molded case and large air circuit breakers; current-limiting molded case circuit breakers; combination circuit breakers and current-limiting fuses; fusible interrupter switches; and power protectors. In fact, the new Type DR allows you to add, replace or rearrange more types of protective devices in more combinations than ever before

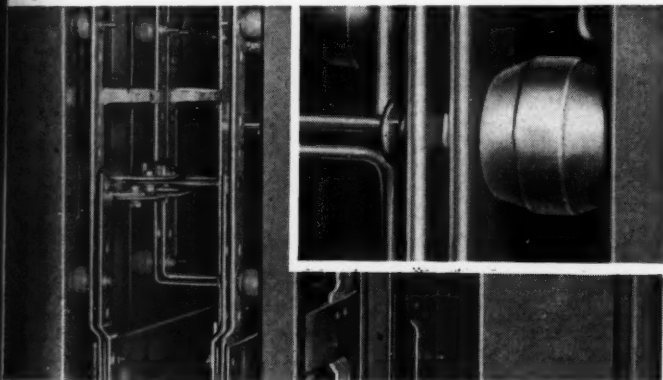
possible; in the field...quickly...and with minimum labor.

The new Type DR Switchboard comes in standard 28", 35" and 47" widths. It is designed for 600-volt or less service and braced for 50,000 amperes asymmetrical (40,000 amperes symmetrical) short circuit current faults as standard, and for 100,000 amperes asymmetrical (85,000 amperes symmetrical) optionally. Its mains are rated 800 to 4,000 amperes.

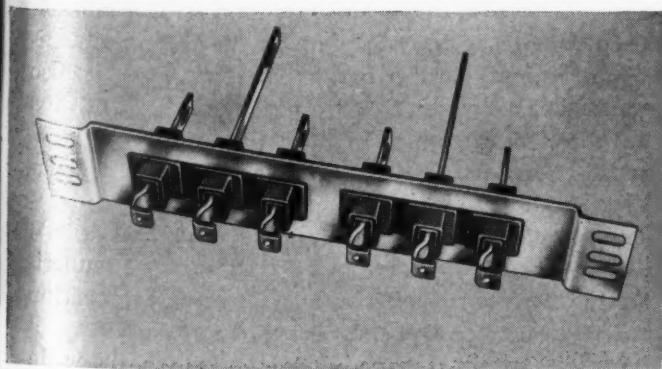
er to specify, estimate, install and expand

Built to pre-determined standards from pre-fabricated components, General Electric's new Type DR Universal Switchboard comes to you as a *known* quantity. It is pre-engineered and pre-tested to give assurance *in advance* of dependable on-the-job performance. We *know* its IC — we *know* its ampere capacities—we *know* its exact dimensions, its safety parameters, the capabilities of each of its components and other functional characteristics. We *know* them and *you* know them—*before* delivery of the switchboard. In addition, this new design and construction provide these other important benefits:

Cut hours from engineering, days from delivery. You can easily lay out and compute for yourself the size and cost of this universal switchboard from published information. Standardization means short-cycle manufacturing . . . frequently allows delivery in as little as one week . . . assures adherence to original delivery schedules, often in spite of last-minute specification changes.



New molded bus insulator adds reliability. Molded in one piece of glass fiber-reinforced polyester, a new insulator increases the reliability of the entire switchboard. This insulator has high impact strength, high arc resistance and low moisture absorption.



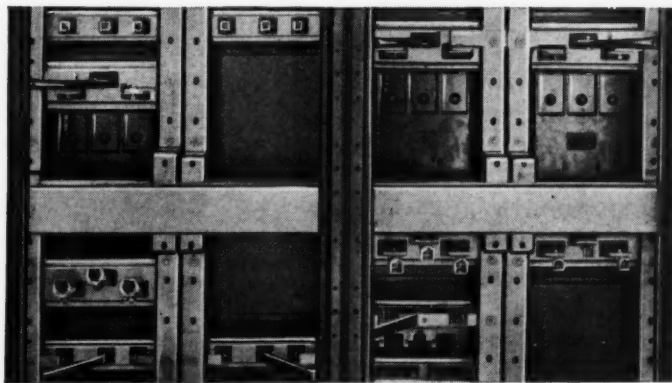
Straight-in wiring, speedier installation with new stud assembly. Eliminates wire bending . . . allows "straight-in" wiring . . . opens up more working space to speed installation. Strong, light-weight, non-magnetic aluminum barrier mounts stud assemblies . . . minimizes heating from induction currents.

Easier to install and maintain. Every terminal is easily accessible for quick, easy connections . . . unobstructed by bus bars or braces.

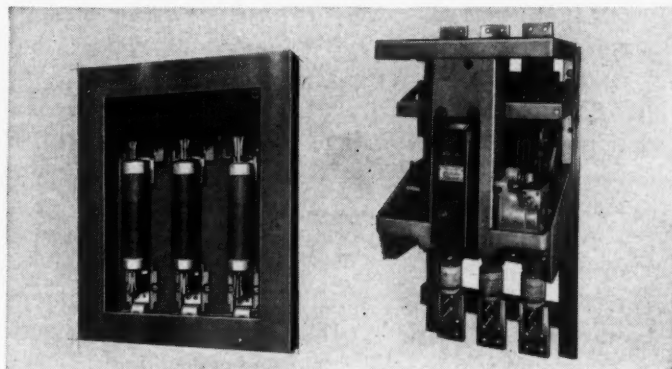
Easier to add capacity. You can easily double the useful capacity of this switchboard for future expansion or unexpected load requirements simply by adding an extra set of pre-drilled bus bars. Bus bars are silver plated, providing low contact resistance.

Easier to modify or expand. New switchboard sections can be added without special fabrication and with assurance of match and line-up. Breakers and switch units can be added or removed without disturbing the established load connections.

See your G-E Representative or G-E Distributor for complete information on Type DR. Ask for Bulletin GEA-6627. Or write to **General Electric Company, Distribution Assemblies Department, Plainville, Conn.**



Horizontal busing provides "elbow room," cuts installation and maintenance time. Main bus bars are at mid-height with vertical step-down bus bars off to each side. Entire rear of switchboard is open, above and below main bus, for full working access to back-connected protective devices.



Latest in Fusible Components. This switchboard incorporates fusible interrupter switches with a 12-times load break rating at a price competitive with conventional pressure switches. Type QMR unit, left, is rated from 30-600A, and the Type LB-1 power protector, right, is rated 800-4000A.

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The Legal Aspect

MELVIN NORD, P.E.

Consultant in Legal and Technical Problems
Patent Attorney

The Law of Municipal Corporations

Consulting engineers very frequently have as clients villages, towns, or cities, in connection with all types of public works. It is therefore incumbent on them to understand at least the basic principles of the law of such legal entities. Since the standard work on the Law of Municipal Corporations runs to twenty volumes, it will be appreciated that our discussion here necessarily will be something less than complete. Nevertheless, there are a few paramount legal aspects of municipal corporations, insofar as consulting engineers are concerned, and we can cover these.

What is a Municipal Corporation?

The most common usage of the term "municipal corporation" refers to a branch of the state government, created by the state legislature to govern a specific territory and its inhabitants—such as a city, town, or village. More accurately, it is a legal entity created by the state, with chartered rights sufficient for the general conduct of local public affairs. Thus, in one aspect it appears in the guise of an instrumentality of government, and in the other as a sort of public corporation or legal entity.

This duality in the nature of municipal corporations is not merely a figure of speech—it is vital to understanding what a municipal corporation is and how it functions.

A municipal corporation, first of all, is like an ordinary or business corporation in the sense that it is a legal entity, capable of owning property in its own name, and capable of suing or being sued in its own name. Like business corporations, municipal corporations are organized under general statutes passed by the state legislatures, and have charters regulating their powers and their relations to their "members," i.e. the inhabitants of the municipality. Furthermore, a municipal corporation has power to engage in certain commercial activities for profit, just as if it were a business corpora-

tion. To be sure, there are limitations on the types of such activities, but that is also true in the case of business corporations.

On the other hand, a municipal corporation differs from ordinary business corporations in many important respects. While municipal corporations can engage in commercial activities, they can do so only if the principal purpose is governmental rather than economic or proprietary. If any profit is made, it is not distributed as dividends, of course, but is held for public use. While business corporations normally cannot tax or assess their members without their consent, municipal corporations can do so. While no one can be forced to be a member of a business corporation, that is not so as regards municipal corporations. Depending on the details of state law, a municipal corporation may be imposed by the state upon the inhabitants of a certain area with the consent of a certain percentage of the inhabitants, or without the consent of any. It is not necessary that a particular individual has consented to be under the jurisdiction of a municipal corporation, in order for him to be, in fact, under its jurisdiction. A municipal corporation is also more like a branch of government than a business corporation in that it has the power to pass local public laws or ordinances (by action of its legislative branch), to interpret them (by its local courts), and to enforce them (by its police, constables, etc.).

Just to make matters more interesting, a municipal corporation is like both a business corporation and a branch of the state government with respect to its immunity from suit. As will be seen later, in some cases, the municipal corporation has legal immunity from suit because it is regarded as a governmental unit, having the immunity of the state; in other cases, the municipal corporation has no legal immunity because it is regarded as if it were a business corporation. This results in endless confusion to the public, and in great fun and profit to

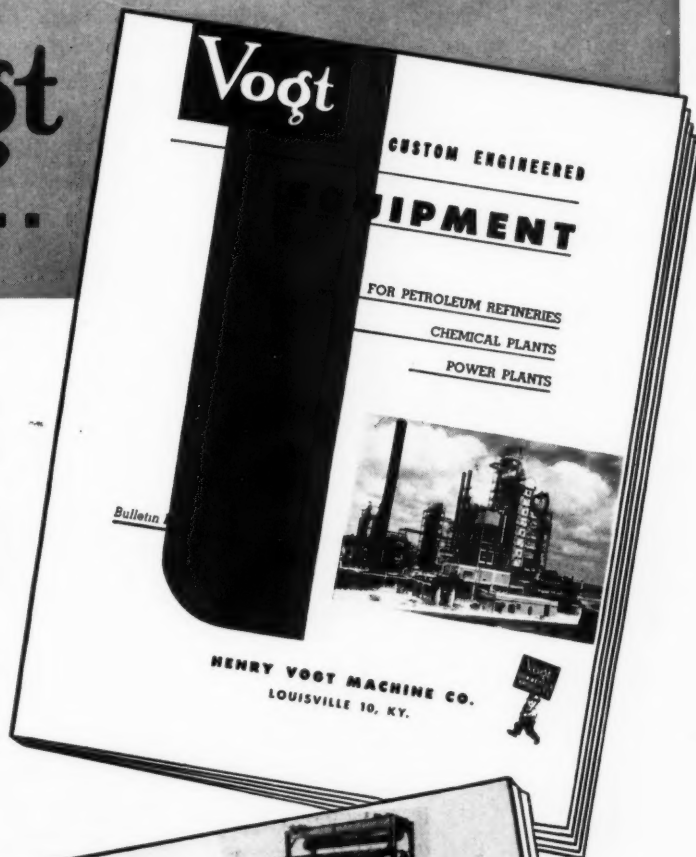
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members of the legal profession.

Unlike Topsy, municipal corporations are not "just grewed;" they are created. The method of creation depends on the statute in the particular state. However, the normal way of organizing a municipal corporation is:

¶ A petition for the creation of a new municipal corporation in a certain area is circulated and signed by the required percentage of the inhabitants of the area.

¶ Notice of the petition and of a

hearing to be held thereon is given the inhabitants of the area.

¶ A hearing is had on the petition, before a specific tribunal, or else a local vote is conducted, depending on the statute.

¶ The result of the hearing or vote is certified. If the result is in accordance with the petition, the municipal corporation is created.

If a bona fide effort to create a municipal corporation has been made, under a law permitting its creation, but there has been a

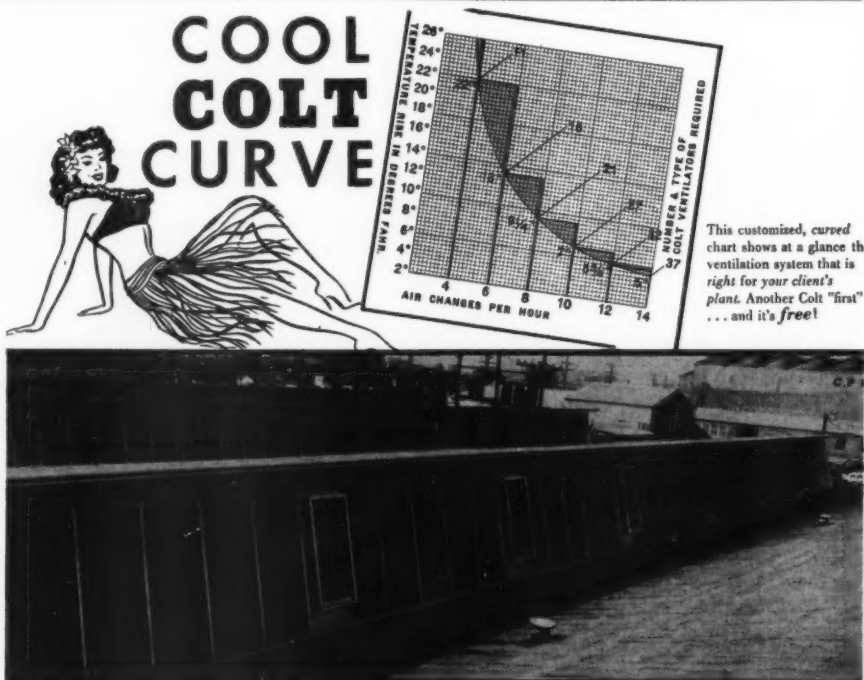
technical legal defect that has remained undetected while the supposed municipal corporation exercised its supposed powers, the legislature may pass a special act validating the municipal corporation's existence. Even if this is not done, the doctrine of the *de facto* corporation applies, just as it does in the case of ordinary business corporations. According to this doctrine, a defectively formed corporation has all the powers of a legal corporation and is free of attack on the ground of improper incorporation, except in a direct attack by the state for the purpose of ousting it from the use of powers which the state has not granted it. This *de facto* doctrine applies only if there has been a good faith effort to comply with the requirements of incorporation, a law under which the corporation could have been formed validly, a defect that is not of vital significance but is merely technical.

The Corporate Organization

Probably the most common form of municipal government is the one which is analogous to the structure of the state and the federal government. In this form, there is an executive, the mayor; a judiciary, the justices of the peace or municipal courts; and a legislature, the common council. In such municipal corporations, the acts of the common council become binding only upon approval by the mayor, or the overriding of his veto.

A modification of this scheme is provided in many states, whereby the functions of the mayor and council are combined in a board of commissioners, generally comprising five commissioners. In addition to possessing the legislative power of the municipal corporation, the commissioners share the executive power, each generally being responsible for a department.

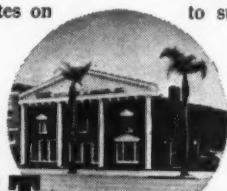
Many states also authorize the use of a city manager form of government, in which the city



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Pictured above are some of the 27 CO/2046 Colt Clear-Opening Adjustable Louver Ventilators installed in the sawtooth roof at the Nardon Manufacturing Co. Installation was carried out without affecting working operations by simply removing panes of glass and inserting ventilators instead. *The customized chart* illustrated at top was used to determine the **most efficient and economical number of ventilators**. Each building presents a different ventilation problem, and as every ventilation system operates on

the law of diminishing returns, *Colt* has devised a unique customized chart, which will enable any engineer to see at a glance the cost of a variety of solutions he may choose to design. *Colt* has records of over 32,500 of the most economical and successful installations throughout the world and their data is available to all engineers. Don't settle for a hit or miss ventilation system! You know before you buy that you are getting your money's worth with *Colt* and *Colt* has a wide range of ventilators to suit every need.



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Safe, reliable operation outdoors the year 'round is assured by Dow Corning silicone insulation. Experience has shown silicone insulated motors readily withstand torrential rains, hurricane winds, corrosive fumes, fly ash, dust, salt air, snow, sleet, cold, heat — even flooding.

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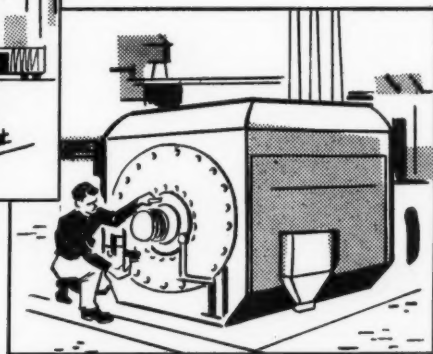
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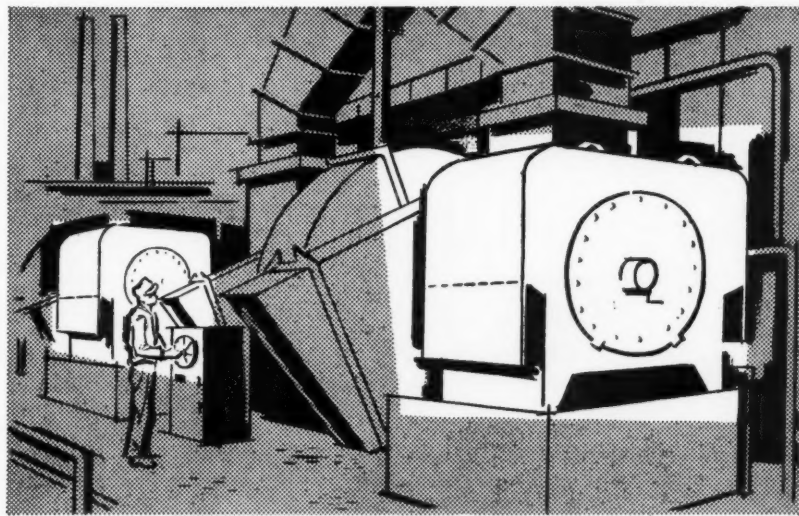
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manager is the administrative head of the government, while the legislative and policy making decisions rest upon the mayor and council.

Liability

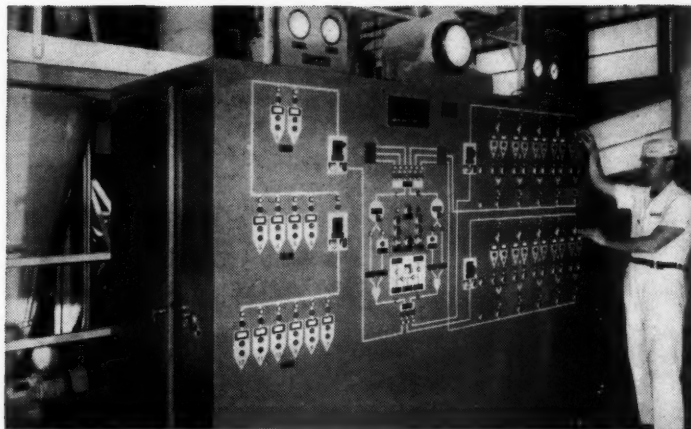
According to the ordinary laws of agency, an employer is liable for the acts of his employee within the scope of his authority. It is this body of law that makes it possible for corporations ever to have legal liability, either in contract, in court, or for crimes. In fact, it is this that makes it possible for corporations to act at all, since they can act only through agents or employees.

With municipal corporations, however, the problem is more complicated. It does not make sense, for example, to hold a city liable for the erroneous judgments of a municipal judge. In this respect, a municipal corporation is obviously more like a branch of the state government than it is like a business corporation. On the other hand, if a municipal corporation employs a man to pick up papers from the street, he is more like an ordinary employee. The rule that has evolved is this: If the act of a municipal employee is judicial or quasi-judicial in nature, in that it involves the exercise of judgment and discretion, the municipality is not liable for his improper actions; but if the action is, on the other hand, merely mechanical or ministerial (that is, it could be done equally well by another person), the laws of agency do apply. This does not mean necessarily that the municipality is liable, for it is still possible that it may have immunity from liability in the particular case. But it does mean that unless the municipality does have such immunity, it is liable under the ordinary rules of agency law.

The question of when a municipality does in fact have legal immunity will be left for consideration in a subsequent column in this series. ▲▲

Let's talk pneumatics

AS APPLIED TO PLANT AUTOMATION



The "brains" of a major pneumatic conveying installation. One man at panel board controls the flow of all bulk material from unloading to storage and from storage to process points.

New plant design, as well as old plant modernization, frequently involves specifications for a high degree of automation in materials handling systems. With an almost endless variety of equipment from which to choose, the consulting engineer has the difficult task of settling on the system—or systems—that will contribute the most to overall plant efficiency.

When the *basic function* to perform involves the handling of dry bulk or pulverized materials, consider the long service, safety, efficiency, ease of installation and installed-cost advantages of an *engineered* pneumatic system—as compared with other types of materials handling systems.

Your requirements might include the automatic unloading of dry materials from trucks, railroad cars, ships and barges, and transporting them through a series of in-plant operations. The basic simplicity of pneumatic conveying equipment—flexibility, relatively few moving parts, and low maintenance help you keep your client's plant operating costs at a minimum.

Plant-wide automation often poses problems of contamination, control of material-movement, storage, and mechanical hazard to product and plant personnel. A totally-enclosed pneumatic conveying system

provides ideal answers to these problems.

Because pneumatic conveying systems are engineered to fit individual requirements, it is important for the consulting engineer and conveyor manufacturer to consult at an early stage in the project development. The Fuller organization, specialists in pneumatic conveying for over 30 years, is prepared to accept full responsibility for the engineering, manufacturing and installation of systems—in full cooperation with the consulting engineer. Also—if pneumatics is not the answer to your needs, Fuller will quickly advise you of that fact. The resulting freedom from complex engineering details leaves the consulting engineer free for the writing of specifications around the broadest functions of materials handling.

HOW TO GET STARTED

1. Remember that successful pneumatic conveying systems require expert engineering assistance.
2. Write for information on systems you will want to consider.
3. Discuss your requirements with a reputable manufacturer while your project is still in the formative stage.

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FULLER-KINYON and FULLER-FLUXO PUMPS for conveying dry pulverized materials • FULLER-KINYON REMOTE-CONTROL UNLOADER for unloading dry pulverized materials from box cars, ships, barges, and flat-bottom storage bins • F-H AIRSLIDE® FLUIDIZING CONVEYOR for fine, dry materials • FULLER AIRSLIDE TRANSFER UNIT • THE AIRVEYOR® for unloading, conveying and reclaiming fine, granular, and crushed materials • FULLER AIRMERGE BLENDING SYSTEM • FULLER ROTARY COMPRESSORS and VACUUM PUMPS • SUTORBILT ROTARY POSITIVE-PRESSURE BLOWERS • GAS PUMPS • VACUUM PUMPS • LEHIGH INDUCED-DRAFT FANS • FULLER PREHEATER Humboldt Suspension Type • FULLER INCLINED-GRATE COOLER • FULLER CLINKER BREAKER • FULLER DRY PULVERIZED-MATERIAL COOLER • FULLER ROTARY FEEDERS and ROTARY VALVES • MATERIAL-LEVEL INDICATORS • MOTION SAFETY SWITCH • AERATION UNITS • SLURRY VALVES •



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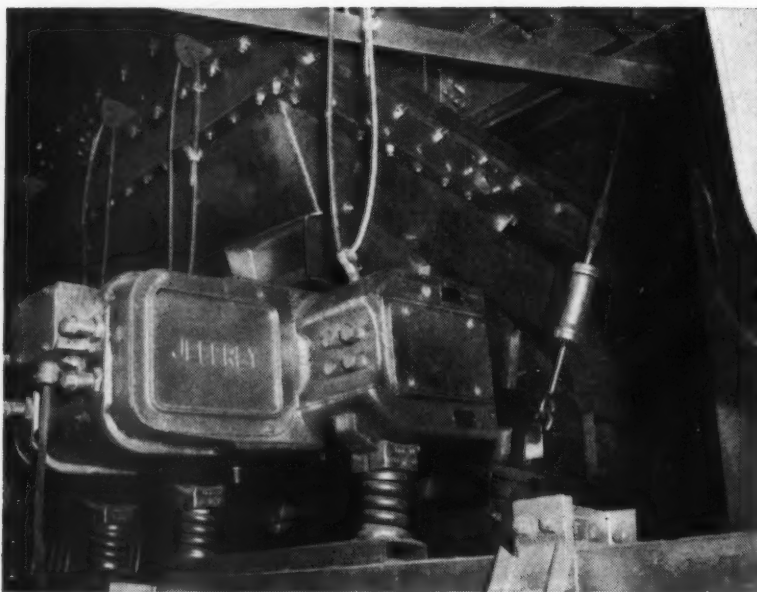
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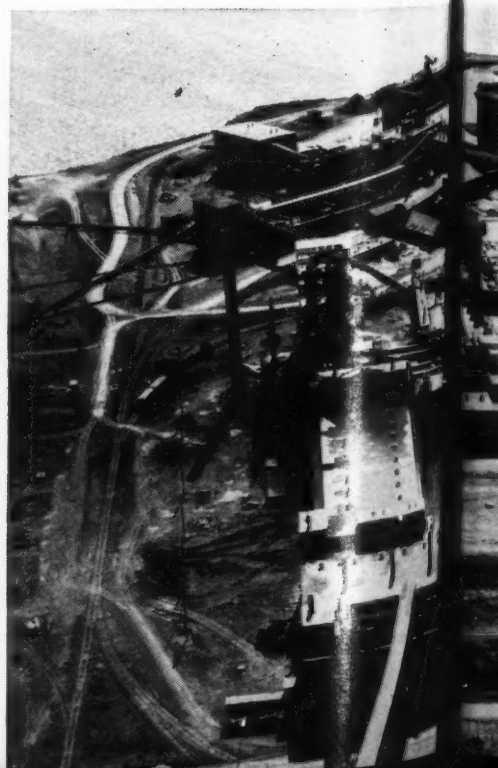
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VIA JEFFREY BELT CONVEYORS AND OVERHEAD SHUTTLE CONVEYORS clinker is placed in huge open storage pile at Huron-Portland Cement Company, Alpena, Michigan.



A JEFFREY VIBRATING FEEDER similar to this is part of system by which clinker is withdrawn by tunnel conveyor and returned to proportioning building.



"Wide-angle view adds depth to expansion picture"

**ROBERT C. McDOWELL,
PRESIDENT
MCDOWELL COMPANY, INC.
CLEVELAND, OHIO, SAYS:**

"When a consulting organization focuses its creative abilities and broad engineering experience on your production setup, they approach it with wide-angle vision. A group like ours, working constantly with industries which are growing, views your operations from a special vantage point. Depth is added to your expansion picture by taking knowledge and stimulus gained in another industry and applying them to planning and constructing more efficient facilities for you."

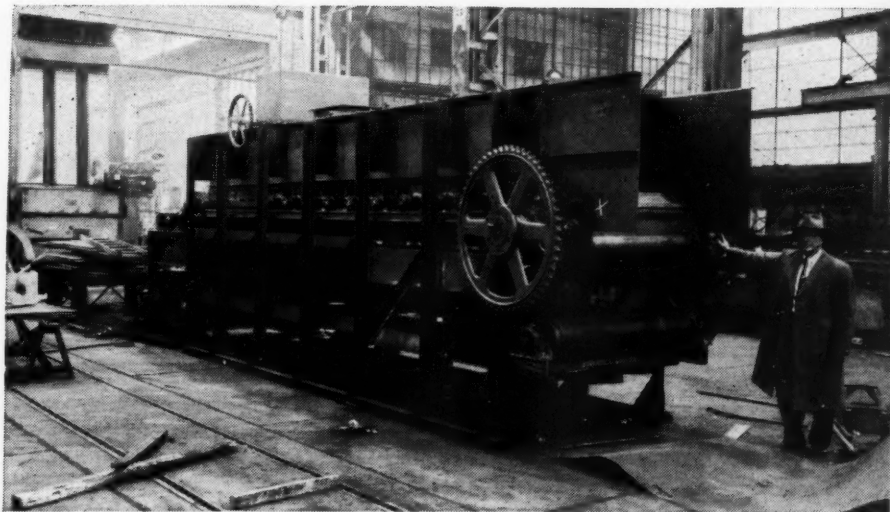
Expansion at the Huron-Portland Cement Company, Alpena, Michigan, has raised annual capacity of the world's largest cement mill to 12 million barrels of portland cement. Total increase is equivalent to adding 3 average-size cement mills to the nation's capacity.

An entirely new system of clinker storage was devised to match new outputs. Stockpiling by belt conveyor into open storage and reclamation by tunnel belt conveyor was a major factor in stepping up capacities and effecting economies in material handling.

Jeffrey belt conveyors, installed by McDowell Company, Inc., replace the overhead cranes and bulldozers used in old storage areas.

It pays to team up with a top-flight engineering company familiar with a wide range of applicable equipment and able to specify products that assure efficient, uninterrupted production in your plant. For details regarding any of our products, get in touch with The Jeffrey Manufacturing Company '822 North Fourth Street, Columbus 16, Ohio.

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JEFFREY APRON FEEDER (with dribble collecting belt) ready for shipment. This unit was specified for an important bauxite handling operation in a recent aluminum plant expansion engineered by McDowell Company, Inc.

▶ **TWO MILES OF CONVEYOR BELTING** is involved in material handling system at world's largest cement mill . . . provides for storage of 2 million barrels of clinker. Aerial view shows system under construction.



Atoms in Action

is for use in solid state photoelectric limit switches, hot metal detectors, and other kinds of position indicators.

UNIVERSITY OF MICHIGAN engineers have started up the state's first atomic reactor. After the reactor is checked out at 100,000 watts it may be raised to a million watts to make it the most powerful reactor in the college field.

INJECTIONS of radioactive carbon-14 are being given to trees in a controlled study of wood growth factors, nutrient uptake, and soil conditions at the new Eastern Research Division laboratory of Rayonier, Inc., a manufacturer of chemical cellulose products. Results will be determined next year when the trees are felled, debarked, ground into fine chips, and converted to chemical cellulose. The isotopes will give off radiation throughout the processing, permitting the research workers to check changes in cellulose characteristics brought about by chemical and mechanical production steps.

BRITAIN'S HARWELL establishment has successfully attained temperatures unofficially estimated at near 5 million degrees C by passing an electric discharge through heavy hydrogen in a large torus, a tubular structure shaped like a doughnut. Purpose of the experiment was to determine whether free neutrons could be created or released by heating heavy hydrogen to near solar temperatures. A small amount of power was released, but it is thought that it probably will be necessary to create temperatures of 30 to 50 million degrees C before a thermonuclear reaction will maintain itself.

A 93-TON CRANE has been built for handling the reactor charge and discharge machine at Britain's Dounreay station, in northern Scotland. The crane is 115 feet long, 47 feet high, and rotates on a circular track 83 feet in diameter. After tests at the Glasgow works of the manufacturer, J. H. Curruthers Ltd., it will be dismantled and taken to Dounreay, where it will be lifted 80 feet above ground level, piece by piece, taken inside the sphere through a small entry shaft, and reassembled on the floor above the reactor.

THE ARMY is studying the possibilities for a nuclear powered off-road land train capable of carrying 150 tons at a speed of about 20 mph. The Transportation Research and Engineering Command believes the vehicle would be economical when used in remote areas on long hauls and over long periods. It would be equipped with

AEC is expected to reduce by one-third the permissible levels of radiation exposure for atomic workers and populations around atomic installations. The new standards probably will follow closely recent recommendations of the National Committee on Radiation Protection and Measurement. Under present AEC standards atomic workers between the ages of 18 and 30 can be exposed to a total of 180 Rems (one Rem is the dose of radiation that will produce the same biological effects as one Roentgen of high voltage X-ray radiation). The new standards reduce this amount to 60 Rems. The reduction is the result of increasing scientific evidence pointing to harmful effects of radiation on present and future generations.

DR. HOMI J. BHABHA, chairman of India's Atomic Energy Commission, predicts that India will have a production of a million kilowatts of electricity from nuclear power plants by 1965. He placed the cost of conventional electricity in India at about 12 mills a kilowatt hour and estimated that nuclear-fueled power plants could produce at about 10 mills per kilowatt hour. India has the world's largest known thorium deposit, estimated at 300,000 tons, found earlier this year in the State of Behar.

WALTER KIDDE Nuclear Laboratories is conducting a radiological survey of soil, water, air, and biological conditions in the vicinity of the IRL (Industrial Reactor Laboratories) Test Reactor being built by AMF Atomics near Plainsboro, N. J. The study will provide information on the radiological conditions before the reactor goes into operation.

A PHOTOELECTRIC DEVICE consisting of a radioisotope source, photoconductive crystal detector, and transistor out-put circuitry and offering advantages of small size, low cost, and maintenance-free reliability has been developed by engineers at Westinghouse. The device

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giant rubber tires for travel on unimproved terrain and would resemble a long sled, with the reactor in the rear, crew's quarters in the front, and the load in between.

CONTROLS for Radiation, Inc., a new company organized to furnish a "package" service covering the broad radiation safety and hazards control aspects of the nuclear industry, will lease and maintain instrumentation for monitoring radiation at or near nuclear facilities. The firm also will evaluate commercially available instruments in the field and assist in establishing radiation protection programs.

A **SEPARATE Nuclear Power Division** has been formed by **Hagan Chemicals & Controls, Inc.** Major function of the division will be application of Hagan instruments and control methods specifically to nuclear power reactors.

WESTINGHOUSE ELECTRIC has under construction a test loop that will be used to simulate slurry flow conditions for the Pennsylvania Advanced Reactor Project (PAR). The facility will permit testing of the interaction of high and low pressure systems, methods for concentration control, and methods for complete filling and draining of the plant. Function of the PAR is to carry out experimental and analytical studies leading to the design of an aqueous homogeneous reactor plant having an output of 150,000 kw. This plant is to operate on the Pennsylvania Power and Light Co. system in eastern Pennsylvania.

FIRST COMMERCIAL production of pure beryllium, an essential material in the construction of nuclear reactors, will be carried out in an induction heated vacuum melting and refining furnace, one of the key units of a new plant recently placed in operation near Hazleton, Pa., by The Beryllium Corp. The Atomic Energy Commission has contracted for the entire output of the plant.

A **WELDING UNIT**, remotely operated and using an inert gas shielded arc welding torch, has been developed and put in use by the Oak Ridge National Laboratory. The unit is used to seal radioactive materials such as cesium-137, iridium-192, and cobalt-60 in cylindrical stainless steel containers for use in high temperature operations, in corrosive solutions, or for storage.

THE SECOND VOLUME in its Nuclear Technology Series has been published by the Atomic Energy Commission under the title Neutron and Gamma Irradiation Facilities. The 79-page, paperbound book describes the 40 U.S. irradiation facilities either operating now or expected to go into operation soon: 26 nuclear reactors and 14 gamma-ray facilities. Price is 60¢ from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. Two more volumes in the series are now being printed: Atomic Energy Facts, and Hot Laboratory Equipment.

CAROLINAS VIRGINIA Nuclear Power Associates, Inc., of Charlotte, N. C., has submitted a formal proposal to the AEC for development, design, construction, and operation of a heavy water cooled and moderated nuclear power plant to be fueled with slightly enriched uranium. Electrical capacity would be about 17,000 kilo-

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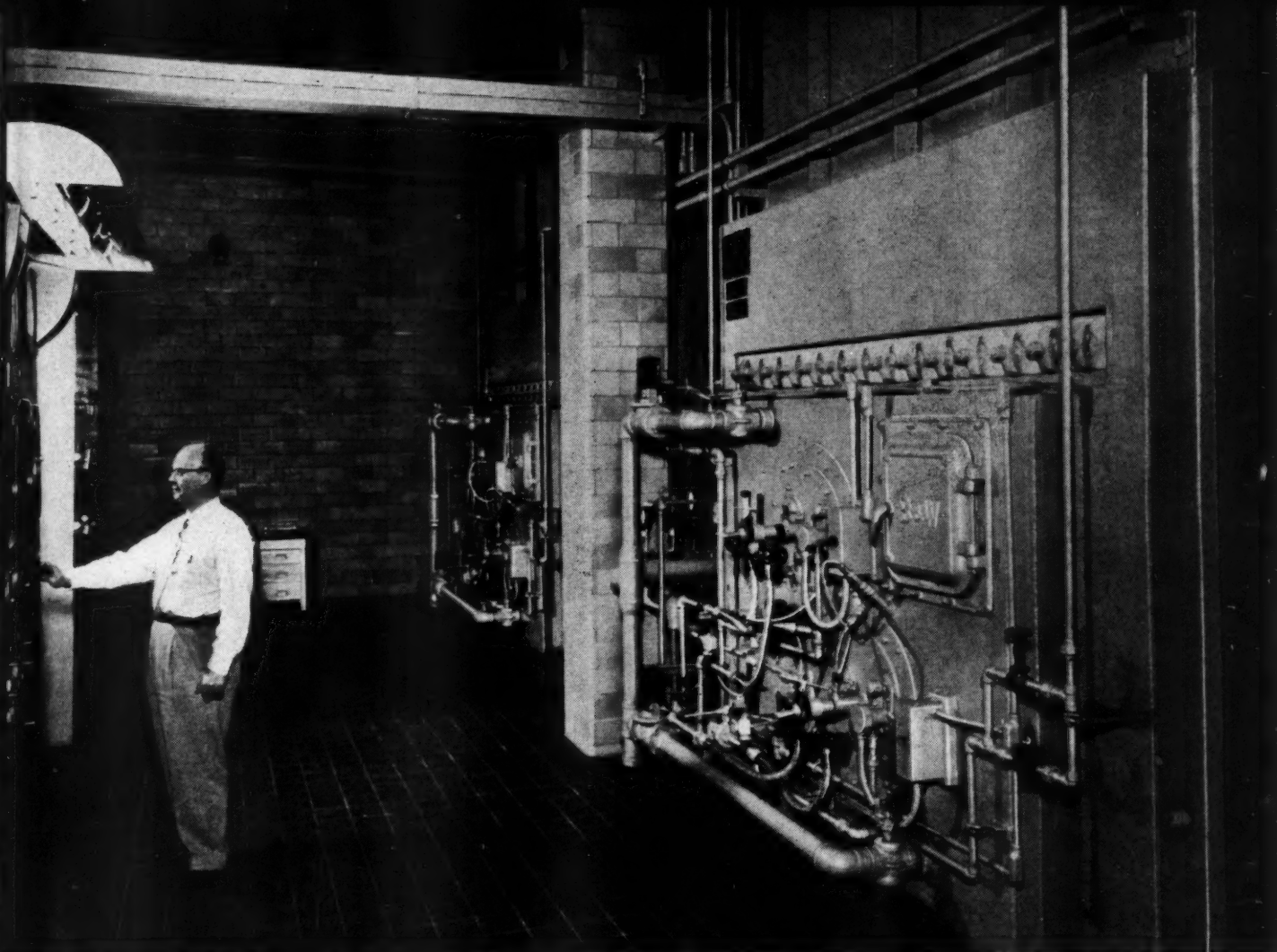
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Hospitals Turn to B&W Integral-Furnace Boilers for Reliable Supply of Clean, Dry Steam

Every day, year after year, even the routine activities of a hospital are vital. The continuous, reliable services expected from hospitals must be matched by the equipment upon which they depend.

Institutions like St. Mary's Memorial Hospital at Knoxville, Tenn., have come to depend upon the reliability and continuity of operation offered by B&W Integral-Furnace Boilers. Cleanliness of operation, high fuel economies, and maximum capacity in small boiler room space are other benefits of these units which appeal to health and budget-conscious hospital management.

Modern, efficient steam supply with ample capacity for future needs, which include a new 105-bed wing and 150-bed nurses' residence with classrooms and auditorium, are being provided at St. Mary's Hospital by two new B&W Boilers.

Flexibility of the B&W Integral-Furnace design is another of the many reasons why St. Mary's and scores of other hospitals throughout the country have selected B&W. The new boiler at Knoxville is oil and gas-fired, with provision made for the installation of a stoker for future coal firing.

Rapid response to steam demands, dependable supply of clean, dry steam, and the ready availability of a nationwide service staff, have given B&W Boilers preference among those who specify and buy for hospitals and institutions throughout the nation. B&W provides a single responsibility in design, engineering, manufacturing, installation, and service through a national network of plants and engineers.

The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

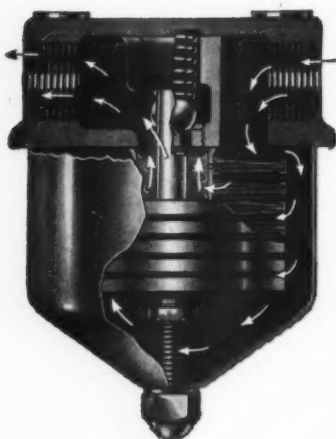


Two B&W Integral-Furnace Boilers at St. Mary's Hospital have capacity of 30,000 lb. of steam per hour each at operating pressure of 110 psi. Design pressure of 160 psi. Architect: David B. Liberman, Knoxville, Tenn. Consulting Engineer: Albert F. G. Bedinger, Knoxville, Tenn.

G-851-FF



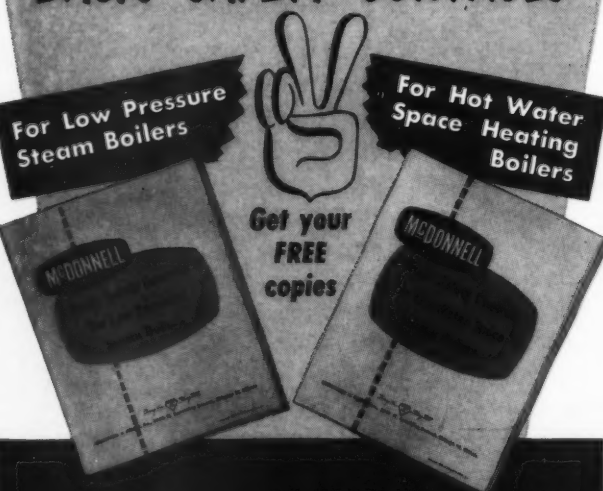
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form of multiple discs which afford over six times more effective area than the same size cylinders. Built-in relief valve optional. Sizes from 1.7 to 720 gpm. Write for bulletin LFC-556. **AIR-MAZE CORPORATION**, Cleveland 28, Ohio.

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Doing One Thing Well

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watts. The group proposes to pay all costs of plant construction and operation, with the Commission supporting the major portion of the costs of development. Stone & Webster Engineering Corp. has been retained as architect-engineer with General Nuclear Engineering Corp. as consultant on nuclear science and engineering problems.

THE SHIPPINGPORT nuclear power station near Pittsburgh will have about the same load response and maneuverability as a conventional plant according to H. A. Van Wassen, of the Duquesne Light Co. Start-up and shutdown times are expected to compare favorably with other plants.

THE FRENCH testing reactor, EL-3, located at Saclay, has gone critical. Heavy water purchased from the U.S. is used as moderator and coolant.

TO PROMOTE Britain's atomic installation and construction know-how a documentary film, in color, will be circulated abroad to prospective buyers. The film is sponsored by four British companies that played prominent parts in the building of Calder Hall and Dounreay.

THE EXPERIMENTAL Boiling Water Reactor at Argonne was designed for an out-leakage of heavy water for all equipment of only one pound a day, as compared to conventional plant leakage of about 1000 lbs a day. The plant presently is using ordinary water but will eventually be switched over to heavy water. Heavy water costs about \$28 per pound — \$233 per gallon.

BRAZIL'S 5000-kw swimming pool reactor, located on the University of Sao Paulo campus, went critical in September. The most powerful reactor of its type on line to date, the reactor is fueled by 20 percent enriched uranium-235, the maximum enrichment available for use in foreign research reactors.

UNTIL 1956 the United States imported 99 percent of its niobium (formerly called columbium) and tantalum, most of this coming from Africa. Although most of these rare earth elements used in the atomic industry still are imported, the percentage has decreased with the working of euxenite mines (a source of tantalum, niobium, and uranium), in Bear Valley Creek, Idaho. In 1956 worldwide production of the two elements declined 17 percent while the U.S. increased its yield by 1700 percent, largely from Bear Valley.

RADIOLOGISTS believe that, with improved techniques, it should be possible to reduce individual exposure to X-rays in medical treatment by at least 50 percent. The new techniques include use of more sensitive films, fast film developers, and improved shielding against X-ray radiation.

"THE MECHANICAL ENGINEER in the Nuclear Industry" will be the theme of the nuclear program planned as part of the American Society of Mechanical Engineers' Annual Meeting, starting Dec. 2 in New York City. The program will stress the problems the mechanical engineer faces in applying his art to the nuclear field. Topics to be covered include "Problems with Nuclear Re-

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Overhead materials handling can add a new dimension to your plant! You get the handling speed you need to keep production equipment working at capacity... eliminate the time waste, space waste and dangers of heavy side traffic... free up more floor space for profitable production step up manpower efficiency.

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On the following pages you will see just a few of the hundreds of Trambeam installations that are speeding production and reducing costs throughout industry. For further information, write for the booklet and performance reports offered on the back cover.

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actors for Power Production," "Nuclear Steam Power Plant Components," "Heat Transfer in Nuclear Engineering," and "Thermal and Dynamic Stress Analysis in Nuclear Design."

A FREE PRICE LIST of Atomic Energy Commission unclassified research reports is available from the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Request "AEC Research Reports Price List No. 28."

ENCAPSULATION of large radioactive cobalt-60 sources will be discontinued as an AEC service to the public next March since private firms have indicated that they will be able to provide the service by that time.

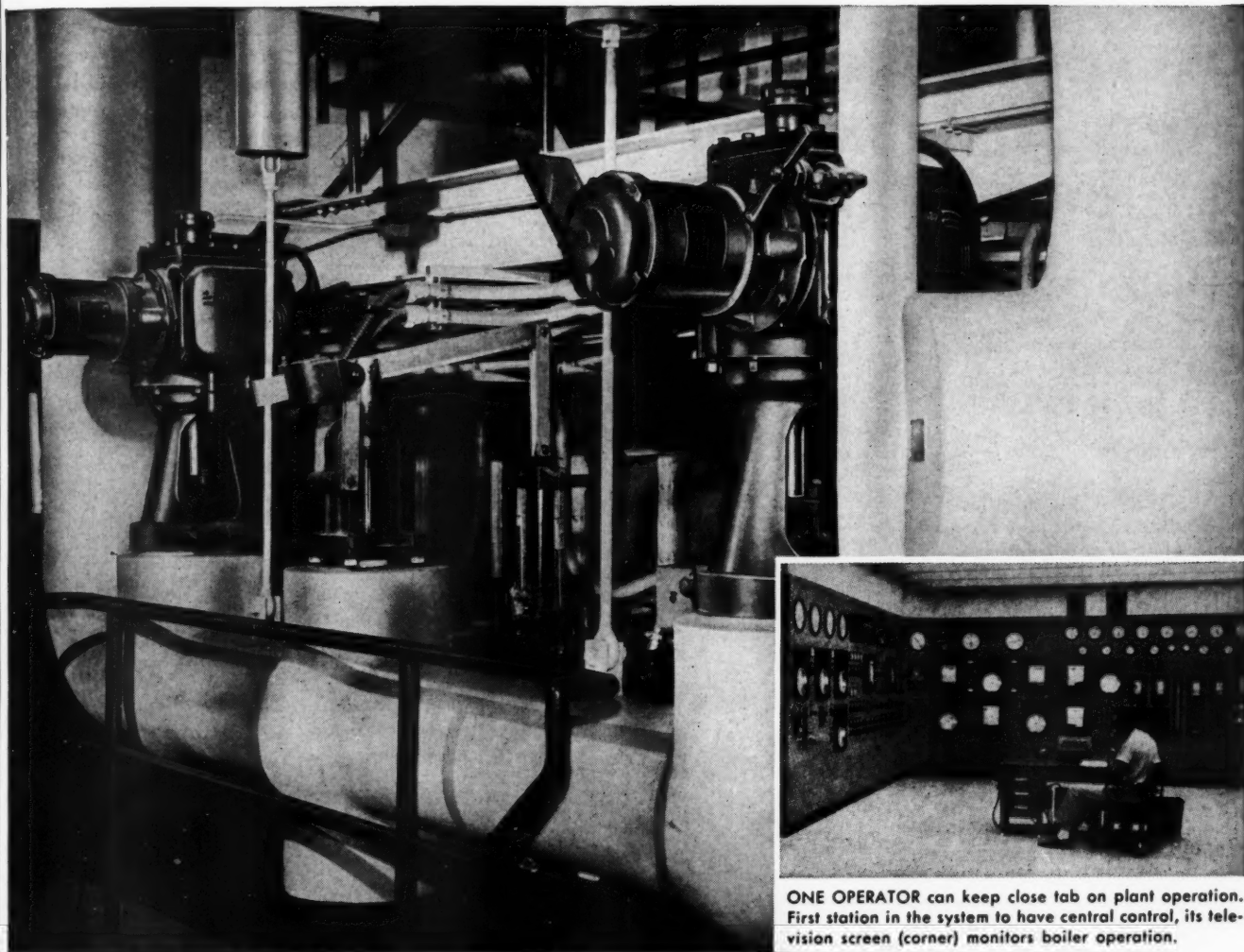
THE AEC and Consumers Public Power District, of Columbus, Nebr., have agreed on contract terms covering construction and operation of a sodium cooled, graphite moderated reactor power plant at Hallam, Nebr. The public power group will provide the site and a 100,000-kw turbine generator, will contribute \$5,220,000 toward costs of construction of the nuclear portion of the plant, and will operate the entire plant for five years. The Commission will bear pre-construction research and development costs, estimated at about \$18 million. The plant will be designed to produce 75,000 net kilowatts of electricity.

MORE THAN 30 research reactors now in operation or under construction are described in the AEC's latest publication, U.S. Research Reactors. The 73-page booklet contains chapters on light water moderated reactors (pool and tank types), heavy water moderated reactors, graphite moderated reactors, homogeneous reactors, and reactors for safety research. It also has a brief glossary of terms. Copies are \$1.50 from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D. C.

THE ENGINEERING TEST REACTOR at Idaho Falls, the largest and most advanced nuclear test facility in the U.S., went critical in September. The \$14 million reactor and its related experimental facilities will be operated for the AEC by the Atomic Energy Division of Phillips Petroleum Co., the firm that furnished the conceptual design. This new facility was built to meet demands for testing facilities with larger capacity than the Materials Testing Reactor. The reactor has a thermal rating of 175,000 kilowatts.

TESTS OF THE USES of the radioactive tracer displacement technique, a highly sensitive method of measuring fluid motion in conduits, are described in two reports of Air Force sponsored research, "Boundary Layer Radioactive Tracer Technique, Part 1—Instrumentation," No. PB111677, 107 pp., \$2.75; and "... Part 2—Application," No. PB121652, 61 pp., \$1.75. Order from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C.

UNDER AN EXTENDED PROGRAM to stimulate education and training in the application of nuclear technology to the life sciences, the Atomic Energy Commission will make financial grants toward the cost of acquisition of specialized radiation equipment and teaching



ONE OPERATOR can keep close tab on plant operation. First station in the system to have central control, its television screen (corner) monitors boiler operation.

Huge 250,000 kwh URQUHART Steam-Electric Station uses LimiTorque Motor Operated Valve Controls

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DEPENDABLE 100% AUTOMATIC REMOTE READING Tank Contents Gauges

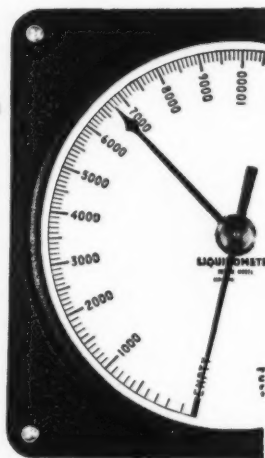
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aids to accredited schools of agriculture, veterinary medicine, medicine and pharmacy, public health, and departments of biophysics and biology in colleges and universities.

THE ORGANIC MODERATED Reactor Experiment, which went critical at the AEC's National Reactor Testing Station in Idaho in September, is the first reactor of this type to go into operation. It uses an organic fluid, terphenyl, for the dual role of moderator and coolant. About 16,000 kilowatts of heat will be produced at full power.

A TEMPORARY REGULATION designed to give immediate protection to the public and to licensees and their suppliers against losses arising from reactor accidents has been issued by AEC, based on the indemnity legislation signed by the President. The regulation will provide protection while a permanent regulation is being prepared.

THE PUERTO RICAN Nuclear Training Center authorized by the last session of Congress is underway with the signing of a contract by the Atomic Energy Commission and the University of Puerto Rico for operation of the Center. First phase of the program is a 1000-kw pool type reactor and a training facility to be built at the College of Agriculture and Mechanical Arts at Mayaguez. Preliminary plans also call for later construction of a training and research building for medical and biological applications of nuclear energy near the new Medical Center in Rio Piedras, and some additional training and laboratory facilities at Mayaguez.

THIRTY-ONE PROPOSALS to perform the engineering design of a natural uranium, gas cooled, graphite moderated nuclear power plant of 40,000-kw capacity have been received by the AEC from U.S. architect-engineering firms. Most of the proposals included the name of sub-contractor firms which would perform the nuclear portion of the design work. A commission selection board will evaluate the proposals and recommend the firm to be chosen. A report on design, including cost estimates and schedule of construction, is to be submitted by the Commission to the Joint Committee on Atomic Energy by April 1, 1958.

UNION CARBIDE Corporation of New York, which has contracted with AMF Atomics, Inc. to design and build a 5000-thermal-kw research reactor of the pool type, has received a construction permit from AEC. The reactor will be used in studies of the effects of radiation on products and processes involving plastics, gases, metals, carbons, and chemicals. Site is Union Carbide's new research center in Orange County, N. Y., in the Sterling Forest area.

THE PORT HOPE, Ontario, plant and nuclear laboratory of AMF Atomics (Canada) Ltd. has begun manufacture of fuel elements for the NRX and NRU reactors at Canada's Chalk River project and other atomic installations. The 200,000-kw NRU, the world's largest research reactor, is expected to go critical shortly. The Port Hope plant is Canada's first privately owned and operated plant and laboratory organized for nuclear research, development, engineering, and manufacture.



Report from the West Coast

RALPH S. TORGERSON
CONSULTING ENGINEER CORRESPONDENT

THE WASHINGTON AND OREGON Associations of Consulting Engineers are more than pleased with the results of their efforts to have the Department of Interior change its policies with regard to requirements for competitive bidding for engineering services. A series of events started with a letter written on February 21 of this year, by C. M. Barr, Secretary of the Consulting Engineers Association of Washington, to E. C. Starr, Chief Engineer of the Bonneville Power Administration, in Portland, Oregon. This letter pointed out that the Consulting Engineers Association of Washington considered competitive bidding for engineering services improper, and it stated that it felt that the procedure used by the Bonneville Power Administration in obtaining consulting services amounted to competitive bidding. The Consulting Engineers Association of Washington sent a copy of their letter to the BPA to J. Donald Kroeker, President of the Consulting Engineers Association of Oregon.

In Mr. Starr's answer to the Washington Association letter, it was pointed out that the Bonneville Power Administration was operating under instructions contained in an April 12, 1955 memorandum from the Administrative Assistant Secretary of the Department of Interior. This memorandum stated specifically that negotiation does not remove the necessity for competition. Under this directive the BPA had been soliciting proposals from several qualified firms and then selecting the firm after appraisal of several factors, only one of which was the engineering fee. Mr. Starr agreed that several firms in the Seattle area had refused to submit proposals when negotiations were to be conducted with more than one engineering firm at a time. It also is interesting to note that Mr. Starr called the attention of the Associations to the fact that the

American Society of Civil Engineers recently had changed its Code of Ethics so that there was no longer a requirement that negotiations be carried on with but one firm at a time, but rather emphasis is placed on the fact that price should not be the *prime* consideration in competitive bidding. The policy of the BPA, Mr. Starr pointed out, was well within this ethical code.*

Following this exchange of correspondence, a meeting was arranged for a discussion of the matter. This meeting included representatives of both the Oregon and Washington Associations of Consulting Engineers, the Oregon Chapter of AIA, the American Society of Civil Engineers, and Mr. Starr, representing the Bonneville Power Administration. At this meeting it became apparent that the intentions of the BPA were of the best and that they had a clear understanding of the problem and appreciated the views of the engineers and architects. The procedure could not be changed, however, without a change in policy by the Department of Interior.

Frontal Attack

Thereafter, the problem was attacked head-on, with a letter from Kroeker, of the Oregon Association, to the Secretary of the Interior. This letter described the situation created by the policies of the Department and submitted considerable background data, including transcripts of court opinions holding that government bodies are not required by law to call for competitive bids for professional services.

The Administrative Assistant Secretary, D. Otis Beasley, responded on April 13, pointing out again that their negotiations took into consideration repu-

*CONSULTING ENGINEER pointed out the serious dangers in this change in ASCE's Code of Ethics at the time the change was made. (See page 16, September 1956.)

tation of the firms, quality of service offered, and delivery requirements—as well as price, and price was “not the determining factor in making the award.”

Mr. Kroeker answered this letter pointing out that the policy of the Department amounted to competitive bidding, despite the multiple considerations, because it called for negotiations with several professional firms simultaneously. Kroeker suggested that

evaluations as to reputation, service, and delivery could be made by the Department before negotiation, and then firms could be dealt with one at a time. If one firm did not satisfy the needs of the Department, negotiations could be dropped, and then begun with another qualified firm.

By this time additional efforts were being made. The members of the AIA present at the April 10 meeting had transmitted copies

of correspondence to their headquarters in Washington, D.C., and the two Associations of Consulting Engineers had informed the Consulting Engineers Council of the situation. Officers of CEC took the matter up with representatives of the Department of Interior on a visit to Washington during the early part of July.

Happy Ending

All this has ended on a happy note. The Department of Interior, in a publication dated August 21, now has revised their Manual, part 404.1.7B, “Contracts for Professional Structural or Engineering Services.” Now, the pertinent section provides that engineering services are to be arranged for through a board of three qualified Department employees, including the contracting officer, and this board is to select at least three firms who might be qualified to do the work in question. These firms then are given a priority based upon reputation, quality of services to be furnished, and the ability of the firm to furnish the service in the time allowed. Following this, an order of preference is assigned the firms and negotiations are initiated with the firm given top priority. “At this time and not before shall cost or fee be discussed.” If agreement cannot be reached, negotiations are terminated and new negotiations begun with the firm having the next order of priority.

This appears to be a sincere effort on the part of the Department of Interior to bring their method of securing engineering services within the ethical requirements of the profession. Engineers all over the country will welcome the results of these efforts by engineers of Oregon and Washington.

CEAC Discusses Advertising

Further south on the Coast, another aspect of professional ethics came up for discussion. At a recent luncheon meeting of the Consulting Engineers' Association of California, in San Francisco, the

Believe us! We know why Cadillac
once published an advertisement titled,

“The penalty of Leadership”



No leader can escape the attention of imitators! There's proof of this rule in Cleaver-Brooks' HEV-E-OIL—today's most-copied heavy oil burner

As stated in the Cadillac advertisement years ago, “In every field of human endeavor, he that is first must perpetually live in the white light of publicity. Whether the leadership be vested in a man or in a manufactured product, emulation and envy are ever at work.”

When introduced eighteen years ago, the Hev-E-Oil burner was a standout and constant improvements have kept it so. It still is the first and only burner successfully applying the principle of low pressure air atomization of heavy fuel oils inside the burner nozzle. At last . . . a burner that could properly use low-cost, high-heat-content heavy fuel oils, such as No. 5.

Hev-E-Oil features are imitated, of course . . . not in their entirety but in adaptations and “pick-ups” . . .

competition scrambles to find “something just as good.”

“If the leader truly leads, he remains . . . the leader.”

Consider these Hev-E-Oil exclusives:

- oil atomized inside the burner nozzle by low pressure air.
- all air for combustion furnished by the burner without draft.
- starting delayed until oil temperature is correct for electric ignition.
- automatic pressure lubrication with lubricating oil.
- the only line of combination oil and gas burners burning either fuel at maximum efficiency.

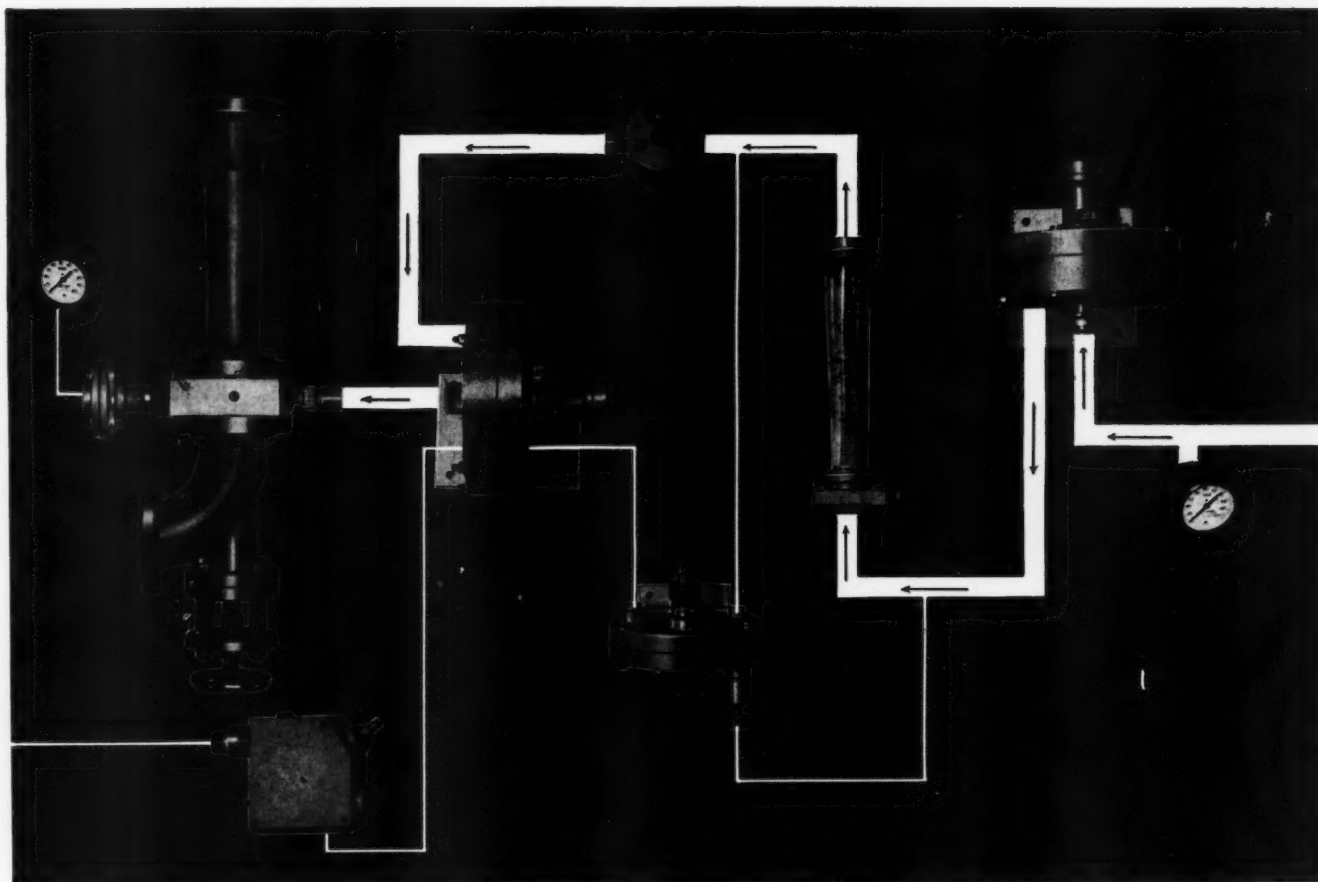
These are the Hev-E-Oil burner features that make it so modern it'll be new and unequalled for years to come.

Write today for complete information.

CLEAVER-BROOKS COMPANY, BURNER DIVISION, Dept. M.
380 East Keefe Avenue, Milwaukee 12, Wisconsin

HEV-E-OIL BURNERS

27 MODELS — 5 GPH TO 90 GPH CAPACITY — INCLUDING COMBINATION HEAVY OIL AND GAS OR LIGHT OIL AND GAS FIRED MODELS.



what to look for in a high capacity chlorinator

Flexibility . . . corrosion resistance . . . safety . . . low maintenance . . . proved performance . . . *whatever* you're looking for, you can be sure of finding it in Fischer & Porter's Model 1052A. The most imitated chlorinator ever introduced, Model 1052A remains unequalled in every major area of chlorinator performance and economy. Engineered from the ground up by chlorine control experts, it's an outstanding example of design from the user point of view.

flexibility matches the job

Model 1052A accommodates flow rates from 30 PPD to 8000 PPD by merely changing the chlorine flowmeter . . . a two minute job. And variable orifice ejector makes operation easy under varying conditions. Models are available for all types of manual, semi-automatic, and automatic operation with or without alarms.

corrosion-resistance for long trouble-free life

Recognized as a triumph in materials engineering, the Model 1052A is fabricated of inert materials throughout. Color is impregnated in the fiber glass plastic cabinet . . . never needs painting or coating. The only metals in contact with chlorine are silver and tantalum. The high pressure inlet tube is solid fine silver, and all other tubing is rigid corrosion-resistant plastic.

safe operation protects plant, personnel, public

System design protects against chlorine leakage, positive

pressure conditions, excess vacuum, and flooding . . . eliminates need for hazardous water seals.

easily maintained for minimum down-time

Maintenance, like operation, requires no special skills. Any component can be removed for inspection with a screwdriver, wrench, and pliers in a few minutes. And engineering service is available from forty field offices across the country.

proved performance assures results

Every feature of the Model 1052A has proved itself in years of actual use. Every material used in construction has successfully withstood many years of severe chlorine service. But the best proofs of performance are the thousands of satisfied users of Fischer & Porter Chlorinators throughout the country.

Write now for complete details on the Model 1052A given in Catalog 70-15, available on request . . . and with it, we'll be happy to provide a list of installations. Visit any one of these and you'll see why so many users have found everything they were looking for in a Fischer & Porter Chlorinator. Write Fischer & Porter Company, 3417 Fischer Road, Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Toronto, Ontario, Canada.



FISCHER & PORTER CO.

Complete Process Instrumentation

topic was "What is Permissible Advertising by Professional Engineers." William W. Moore led the discussion by outlining the basis on which advertising should be conducted and suggested types of media that could be used and those that are objectionable or of doubtful value.

Mr. Moore said that advertising must not be self-laudatory, but should be aimed to increase understanding and use of sound professional engineering services. It should not lower the professional standing of engineering nor be misleading to the reader.

On the matter of selecting media and types of advertising, Mr. Moore expressed the view that professional cards, giving name, address, and scope of work, were of definite value and in good taste even in public magazines and newspapers. Advertisements announcing a new office, moving notice, changes in firm members, and scope of services also were in order. He was doubtful that so-called display type advertising could be justified unless it was prepared carefully to conform to the standards he outlined as the basis of sound advertising. Paid time advertising on radio and television, said Mr. Moore, should measure up to the same criteria. He also viewed the distribution of advertising "give away" items, such as pencils, blotters, and calendars, as not enhancing professional standing.

Articles Permissible

Mr. Moore saw no objection to articles published in technical or other publications or talks and verbal presentations, if they were not self-laudatory. He also said that brochures describing and illustrating services and staff were of value and in good taste if they were accurate and not exaggerated. However, they should not be mailed out indiscriminately but should be distributed selectively.

Frequently professional engineers are confronted with requests to advertise in local news-

papers or magazines in connection with the completion of a large project for which they provided engineering service. The contractors and equipment suppliers generally participate in such advertising, and considerable pressure is brought to bear on the engineer to be a part of this joint publicity. Despite this pressure, most engineers refuse to participate. Architects are not permitted to advertise under AIA regulations, and this gives the engineer a good excuse.

Opinion Cross Section

To get a cross section of opinion as to how these requests are handled and what may be considered proper advertising, engineers were asked to give their views on the subject. In general, engineers do not set up any part of their annual budget for advertising. Many of them do carry professional card advertising in local publications, and some use national technical publications. Although nearly all engineers indicate that the professional card is the proper form of advertising, there are some who question this type as not offering enough eye appeal. It is not so much a matter of content as it is of display.

Nearly all engineers do cooperate with local newspapers and magazines to supply photographs and information about projects. Some engineers have public relations departments set up for this purpose, or publicity may be handled by an outside public relations firm.

Commenting upon the type of advertising that is appropriate for the consulting engineer, Hugh C. Miller, of Whitson-Miller and Associates, Tacoma, Wash., said, "It is our opinion that such advertising should be kept on a very professional and informative plan and not self-laudatory. There is no doubt in our minds but that there is a definite need for advertising in a proper manner on the part of consulting firms, especially in view of the type and amount

NOW!
For Immediate Delivery!

**Over \$1,000,000 In
ASCO Solenoid Valves
Regularly Maintained
In Stock**

2-WAY

Normally Closed and Normally Open

Pipe Sizes: $\frac{1}{8}$ "—2"
Pressures: to 1500 P.S.I.
Voltages: 115-230-460/60
Solenoids: General Purpose,
Watertight, Explosion Proof
Services: Air, Water, Oil, Gas, Steam

3-WAY

Normally Closed and Normally Open

Pipe Sizes: $\frac{1}{8}$ "— $\frac{1}{2}$ "
Pressures: to 600 P.S.I.
Voltages: 115-230-460/60
Solenoids: General Purpose,
Watertight, Explosion Proof
Services: Air, Water, Oil, Gas, Steam

4-WAY

Pipe Sizes: $\frac{1}{4}$ "—1"
Pressures: to 300 P.S.I.
Voltages: 115-230-460/60
Solenoids: General Purpose and
Explosion Proof
Services: Air, Water, Oil

HAND RESET

2-WAY

Pipe Sizes: $\frac{1}{2}$ "—1"
Pressures: to 250 P.S.I.
Voltages: 115/60
Solenoids: General Purpose
Services: Air, Water, Oil, Gas

3-WAY

Pipe Size: $\frac{3}{8}$ "
Pressures: to 250 P.S.I.
Voltages: 115/60
Solenoids: General Purpose and
Explosion Proof
Services: Air, Water, Oil, Gas

STRAINERS AND FILTERS

Pipe Sizes: $\frac{1}{8}$ "—3"
Pressures: 250 P.S.I.; 450°F
Services: Air, Water, Oil, Gas, Steam

Special purpose solenoid valves and accessories are also stocked.

All sizes and types of ASCO Solenoid Valves now carried in stock by our warehouse in Los Angeles, and by stocking distributors in all principal cities.

Send for ASCO Solenoid Valve
Stock List and Selection Guide.

ASCO

Automatic Switch Co.

50-CC Hanover Road, Florham Park, New Jersey
Frontier 7-4600

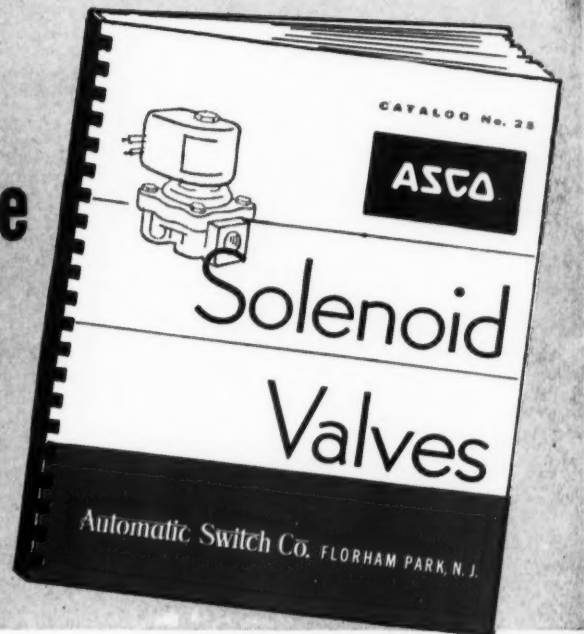
CONSULTING ENGINEER

ASCO makes Solenoid Valve selection simple

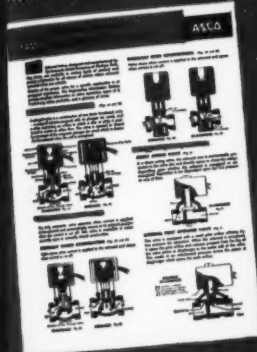
**Comprehensive Design Engineering Data Now Available
Keys Proper Solenoid Valve to Application**

Specifically designed to make the selection of solenoid valves simple, the ASCO Valve Catalog gives you the most comprehensive engineering data available to aid you in your solenoid valve selection.

Here are 114 pages of up-to-date valve information. These pages incorporate detailed engineering sections. Finding the proper valve for your particular application is made easy by a simple *master index* which leads you to a *separator* where you will find all the valves of the type you require. Each *separator* has a more detailed *index* which will enable you to turn right to the *valve bulletin* needed to meet your particular requirements.

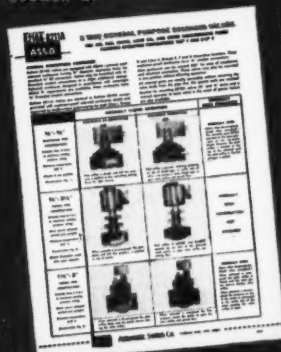


Section 1.



GENERAL ENGINEERING INFORMATION
Expanded engineering data with diagrams, gives valve construction, operating principles, features. With nomographs using Cv ratings for valve sizing.

Section 2.



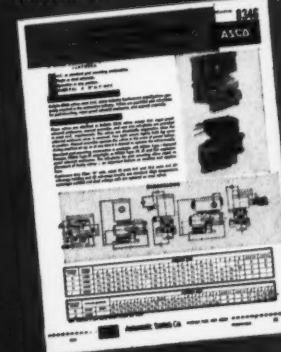
2-WAY VALVES
Covers all 2-way valves of the fully automatic type for a wide range of pipe sizes and pressures.

Section 3.



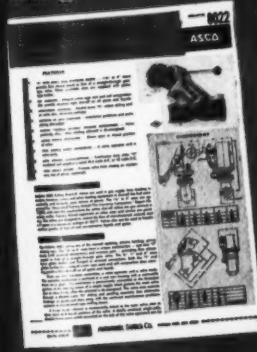
3-WAY VALVES
Detailed information on fully automatic valves for pilot control of diaphragms or cylinders, or for diverting flow in pipelines.

Section 4.



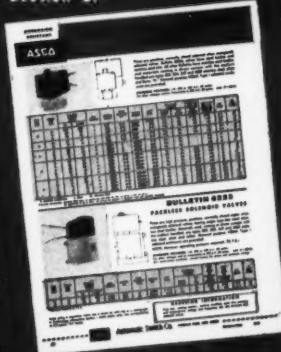
4-WAY VALVES
Fully automatic types covered. Both single and dual solenoid construction for general purpose and J. I. C. requirements.

Section 5.



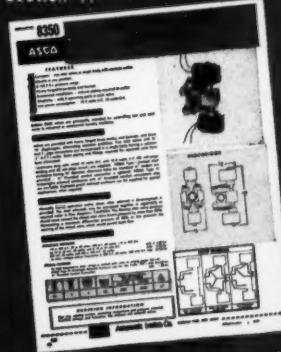
MANUAL RESET VALVES
2 and 3-way solenoid valves for safety shut-off applications.

Section 6.



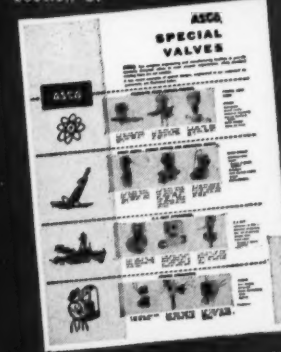
CORROSION RESISTANT VALVES
Includes 2 and 3-way solenoid valves for handling corrosive gases and liquids. Section incorporates a selection guide chart.

Section 7.



SPECIAL PURPOSE VALVES AND ACCESSORIES
Special purpose equipment: waterproof and explosion proof solenoids, laundry valves, cylinders, etc.

Section 8.



NUCLEAR VALVE DATA
Shows ASCO specialized solenoid valve designs for nuclear, guided missile, Navy and dispensing applications.

You may order the complete catalog or individual sections or bulletins. You will find easy to use return reply cards in each catalog for ordering additional literature. Also available is the Electromagnetic Control Master Catalog 57-S or any one of the six sectional Catalogs covering Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, Solenoids or Electric Plant Controls.

Any of these important engineering reference aids may be obtained by writing Automatic Switch Company — on company letterhead only please.

Automatic Switch Co.
50-CC Hanover Road, Florham Park, New Jersey
FRontier 7-4600

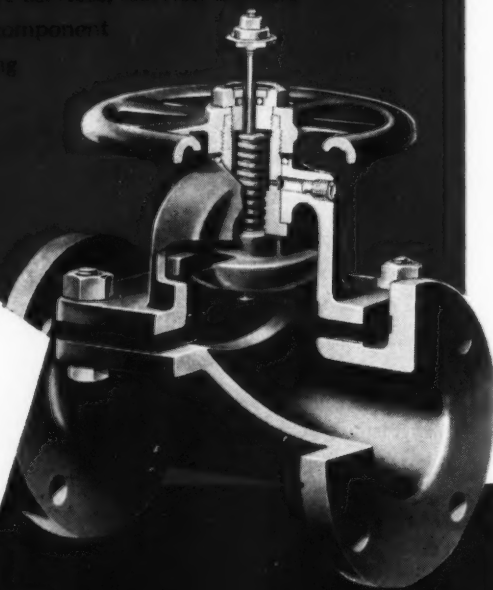
ASCO

STOP costly leaks with positive control **DIAPHRAGM VALVES**

When there's a valve leak, there's a plant leak. The new Hills-McCanna Diaphragm Valve gives positive control on the size of cut-off—for liquids, gas, corrosive services, slurries, air, and water. This precision, tri-component valve with exclusive sealing head diaphragm assures leaktight closure.

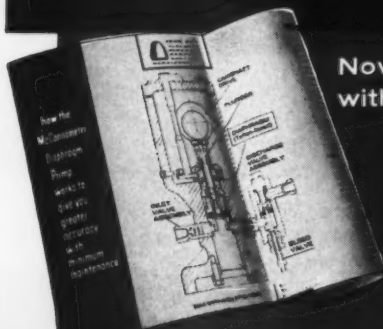
Write today for Valve
Booklet #104

**EXCLUSIVE
SEALING BEAD
DIAPHRAGM**



Hills- McCanna company

THE PEOPLE WHO _____ AND _____ FLOW



Now... Precision Fluid Metering
with NEW DIAPHRAGM PUMP

New McCanna Diaphragm Pump delivers new high pressure range, new broad capacity range, new wide operating speed range, and maintenance costs. Write for "A New Concept in Precision Metering and Proportioning of Fluids." Ask for Booklet #301.

That cost for

Hills-McCanna Company, 7444 W. Niles St., Chicago 18, Illinois

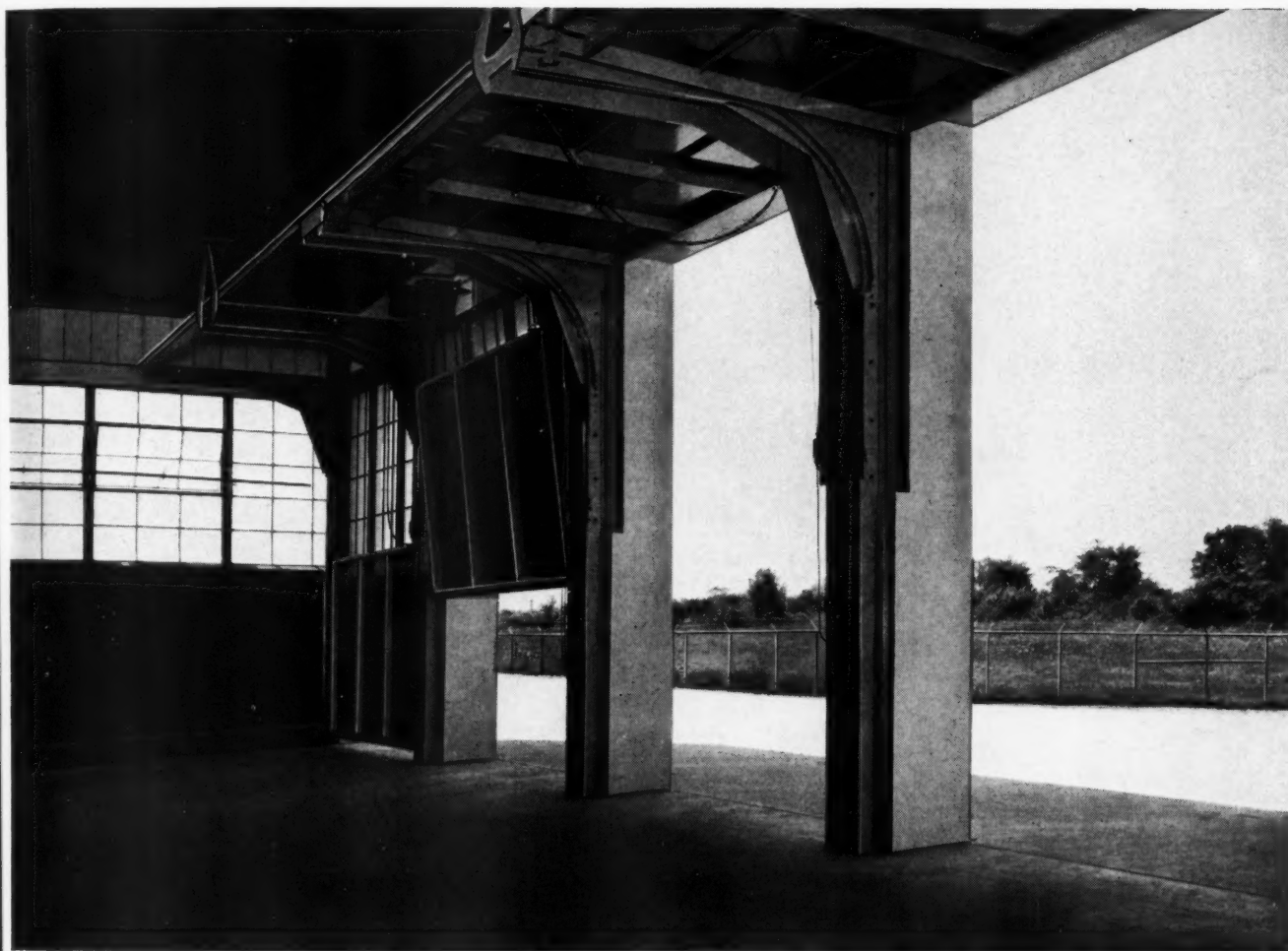
of advertising done by contracting-engineering organizations. Our advertising should emphasize the integrity and responsibility of consulting engineers as opposed to other types of firms offering contracting and engineering or free engineering services. It is felt that much could be accomplished by consulting engineering organizations to pave the way for the proper type of advertising on the part of consulting firms."

James C. Howland of Cornell, Howland, Hayes and Merryfield, Corvallis, Ore., resists pressure from local newspapers and magazines to advertise in connection with completed projects by advising solicitors that "it is not within the scope of our code of ethics to advertise in such a manner." Mr. Howland expressed some misgivings as to card advertising. "We have operated on the basis that the only appropriate type of advertising for a consulting engineer is the professional card. We are not entirely sure that this is true. We feel that it might be desirable for consulting engineers to use advertising of a more eye-catching nature. It seems that this matter should be clarified by some organization such as the Consulting Engineers Council.

Arthur A. Sauer, structural engineer, Sacramento, Calif., reported that he does not have much of a problem with local newspapers soliciting advertising in connection with completed projects, as most of his work is for architects. He does express the view however, that "where the structural engineer does work for an architect, it would be desirable and appropriate to have the engineer's name mentioned with the architect's in articles and construction pictures used in newspapers and magazines."

Harry J. Woelber, of Portland, Ore., says he has no advertising budget set up, but he cooperates with newspapers by supplying news items.

James D. Caulfield, Portland, Ore., reports that his advertising



These industrial doors require only 24 inches of head room above lintel



THE BYRNAPERTURE—The latest in many Byrne innovations in aircraft hangar door design. Provides a completely weather-tight closure around the plane fuselage.

When head room above door openings is limited, the Byrne Custom Turnover Door provides the perfect solution to the problem. Also, in its full open position it projects back into the building only half of the door opening height. It is a "space-saver" in every sense of the word.

This is only one of a wide variety of doors built by Byrne for industrial and commercial buildings. All are thoroughly engineered to meet specific requirements—structurally, mechanically and architecturally. Complete information is contained in the new Byrne catalog. May we send you a copy?

BYRNE doors, inc.

1603 E. Nine Mile Road, Ferndale, Detroit 20, Michigan

101 Park Ave., New York 17, N.Y. • Cafritz Bldg., Washington, D.C.
Byrne Doors, Ltd., 381 College St., Toronto 2B, Ont.



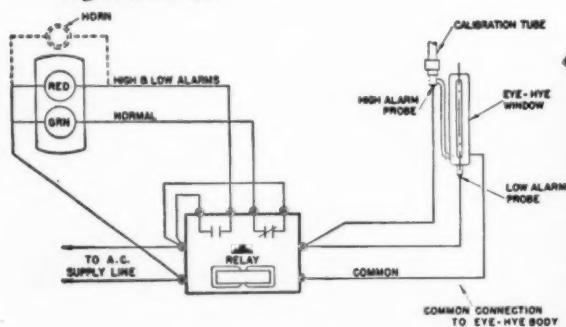
Why not *triple*
your boiler water
level safety!

**Remote reading Reliance
EYE-HYE gives you extra sound and
sight alarms when you add the Levalarm**

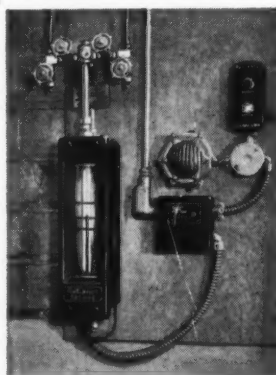
Improve the safety of water level supervision *even more* than EYE-HYE's recognized remote reading advantages; add *extra alarms* at small cost. Reliance electrode Levalarm EA9 augments the illuminated sharp-reading EYE-HYE with vibratory horns or signal lights, or both. They work instantly to alert operators when water levels reach danger points.

The boiler water itself calls the signals! Stainless steel electrodes with teflon insulation pick up a tiny current. Sensitive relays make or break independent circuits that operate the alarms. Levalarms work on low pressure or high.

Reliance Light Indicators, 2-light or 3-light, show green for normal water level — red for dangerous low or high condition. Horns are sturdy noise producers that demand action . . . Low alarm Levalarm can be installed on most EYE-HYEs in service. High alarm facility must be added at our factory. Send EYE-HYE serial number and ask for catalog section C6.



Wiring diagram for high and low alarm hook-up with 2-light indicator and/or horn.



Example of compact hook-up—EYE-HYE with horn and 2-light indicator. The extra signals can be placed any desired distance from the EYE-HYE.

Electrodes used in Levalarm EA9 withstand effects of high temperatures. Require no adjustment.

The Reliance Gauge Column Co., 5902 Carnegie Ave., Cleveland 3, Ohio



Reliance EYE-HYE

Remote Reading Gage

All-hydrostatic • Reads like a tubular glass gage

is restricted to an insertion of a card every other issue in the *Oregon Professional Engineer*. A simple brochure, describing the engineering service, is delivered in person or is sent upon request to prospective clients.

A. M. James, of James and Honey, Portland, Ore., advises that his firm furnishes photographs and basic data on local projects to newspapers, but no advertising is purchased. Mr. James believes that "successfully completed projects are the best advertisements for consulting engineers." He further added, "The employment of advertising and public relations techniques by some consulting firms has led to a situation where instead of the best-qualified engineer getting the work, the best-advertising engineer gets it. 'Painless Parker' was certainly one of the best advertised men in his profession, but we doubt that he contributed much to the progress of dentistry. My personal opinion is that advertising has a poor effect on the professions, including consulting engineering."

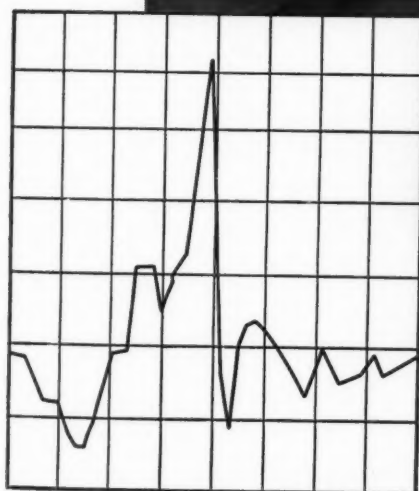
Legislative Council Elects Officers

The California Legislative Council of Professional Engineers, which held its annual meeting in San Diego, Calif., September 21, elected the following officers to serve two years: president, W. D. Soule, San Mateo; first vice president, Philip W. Helsley, San Diego; second vice president, Leonard D'Ooge, Sacramento; and secretary-treasurer, Pecos H. Calahan, San Francisco.

Action by the Council included appointment of a committee to review the section in the existing Engineers' Act relating to corporations and partnerships and to make a recommendation at the next meeting of the Council. Another committee was appointed to study the desirability of mandatory registration for all branches of professional engineering and to draft legislation to that end if it appeared to be advisable.

BROWN BOVERI GAS TURBINES

*A. New
Concept*



*For
Peak Loads*

DEPENDING on the load, either the 7,000 kW single shaft or the 25,000 kW non-regenerative cycle Brown Boveri Gas Turbine provide the answer to the rigid demands of peak load service. *They can be put on the line in 20 minutes or less.*

Their on-the-job performance records—in over 60 power plants throughout the world—conclusively indicate not only economy of operation but sizeable savings in initial costs.

If your problem is peak or base load service, it will pay you to investigate Brown Boveri Gas Turbines.



BROWN BOVERI CORPORATION

19 RECTOR STREET

NEW YORK 6, N. Y.

Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Buffalo, N. Y. • Chicago, Ill. • Cleveland, O. • Dallas, Tex. • Denver, Colo. • Detroit, Mich. • Hamilton, O. • Jacksonville, Fla. • Kansas City, Mo. • Knoxville, Tenn. • Miami, Fla. • Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Pasadena, Cal. • Pittsburgh, Pa. • Portland, Ore. • Roanoke, Va. • San Francisco, Cal. • San Juan, P. R. • Syracuse, N. Y. • Tucson, Ariz.

WELBOND[®]

is the valve

for high pressures, high temperatures



Yarway Welbond Valves are available in 9 sizes, 1/4" to 2 1/2", angle and straightway designs. Pressures to 2500 psi, temperatures to 1050° F.

Welbond is the valve designed by Yarway specifically to provide modern steam power plants with the ultimate in high pressure, high temperature valve service.

These special Welbond features insure improved valve performance:

- **Stem** of 321 stainless steel, used with special **packing** to prevent stem corrosion
- **Easy and quick accessibility.** All working parts removable through yoke.
- **Non-distorting, thermally-compensated seat**
- **Ventilated, easy grip handwheel**
- **Streamlined flow** through body

Welbond Valves are winning approval on superheater vents and drains, water wall drains, economizer drains, steam gage shut-off, strainer blow-off and many other steam plant services. Your Yarway man will be glad to discuss applications for your plant.

For full information, write for Yarway Bulletin B-452.

YARNALL-WARING COMPANY

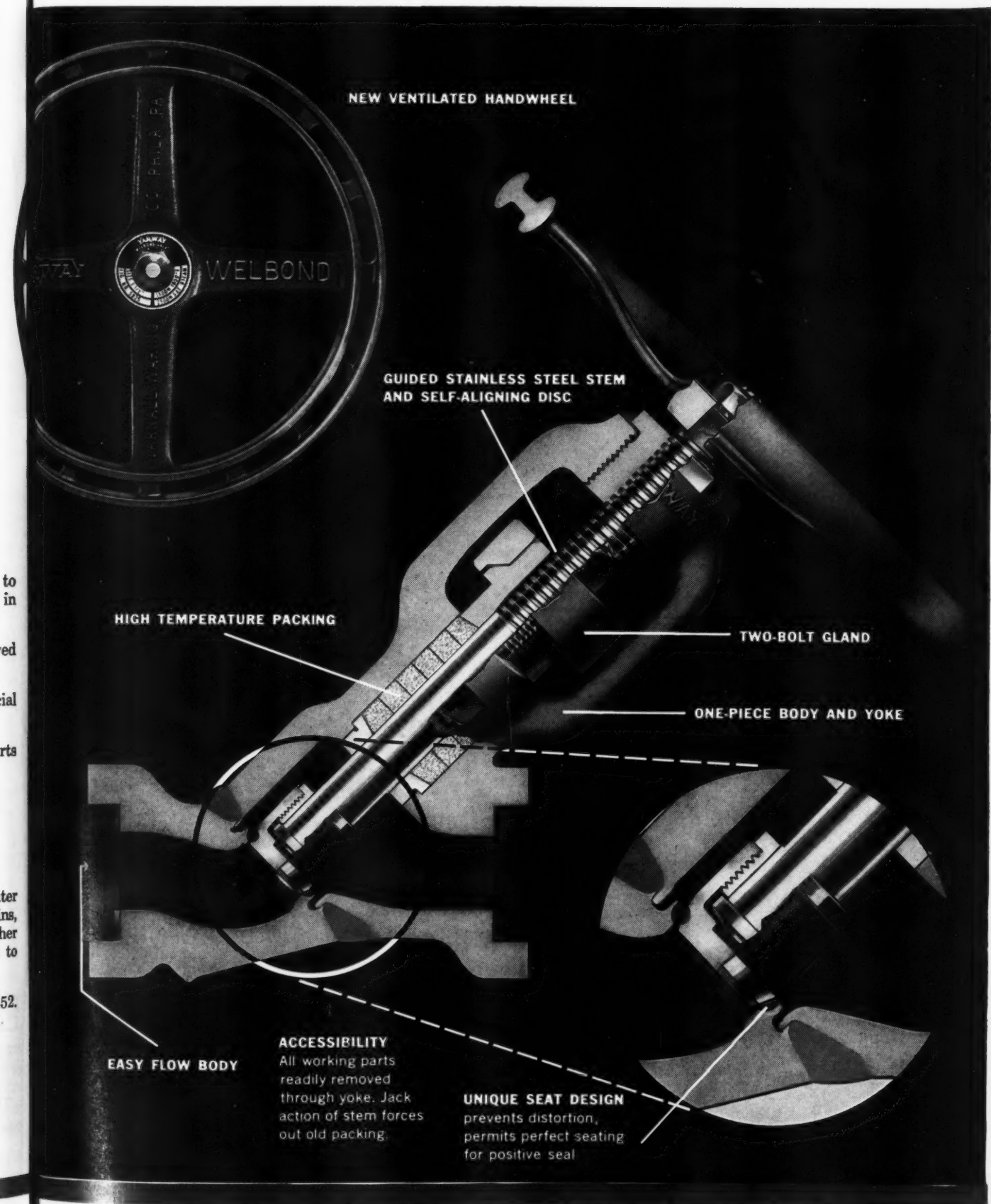
106 Mermaid Avenue, Philadelphia 18, Pa.

BRANCH OFFICES IN PRINCIPAL CITIES

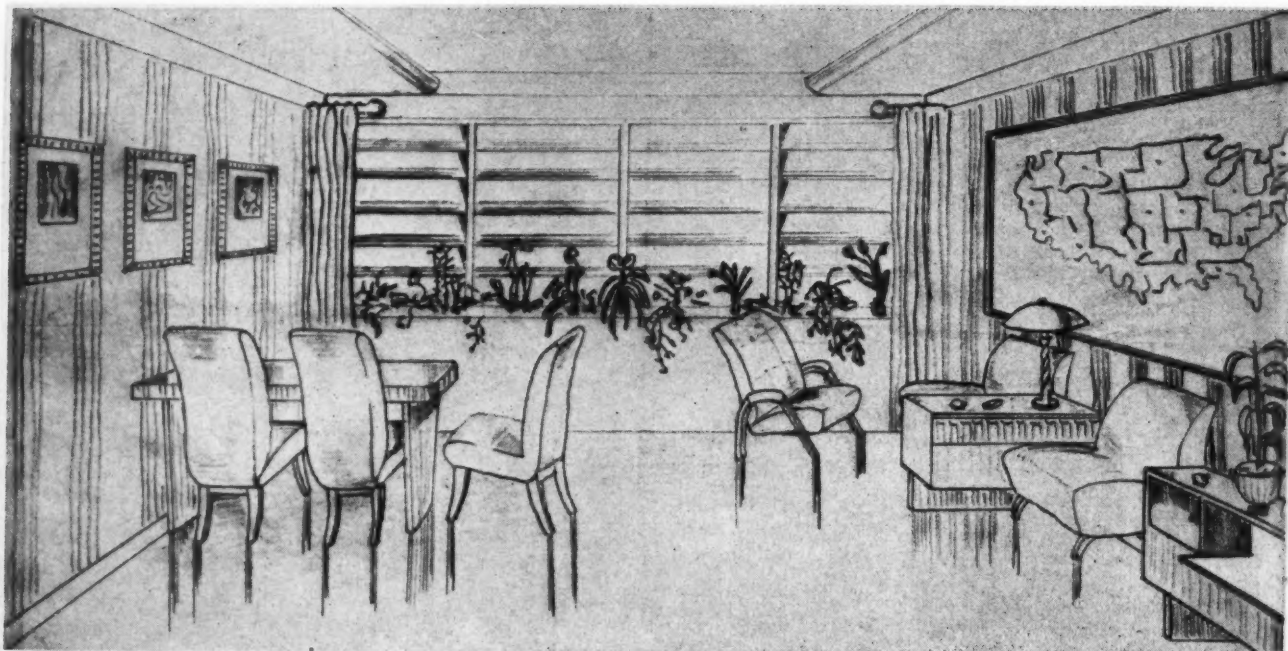
YARWAY

WELBOND

a good



way to specify high pressure/high temperature valves



THE OFFICE WITHOUT A DESK, POPULAR ON MADISON AVENUE, MAY SUIT TOP ENGINEERING FIRM EXECUTIVES.

Decorating an Office for an Engineer

DAVID FARSANG, Interior Decorator

David Farsang, who has a decorating shop at 1068 Lexington Ave., New York City, started his career in a familiar manner — on the drafting board. Born in Budapest, Hungary, in 1910, Farsang was educated at the Royal Hungarian School of Technology, graduating in 1929, and coming to America the next year. He first worked as a cabinet maker and then became a teacher of interior decoration. During the war, he worked for Wright Aeronautical Corp., converting metric measurements to inches, so the American workers could work from European drawings. Farsang opened his own shop after the War and has concentrated on office decorating.

WHY CALL IN a decorator when you plan to remodel your offices? Because good decorating is like good engineering. It may seem to cost more at the outset, but actually it gives you more for your money.

A pleasant, orderly office will increase anyone's work capacity. It shows the employees that the engineer thinks highly enough of their profession to invest in their surroundings. And as for that all-important first impression, you may be sure a prospective client has formed some idea of your firm by looking at the reception area and your office before you even get a chance to speak to him.

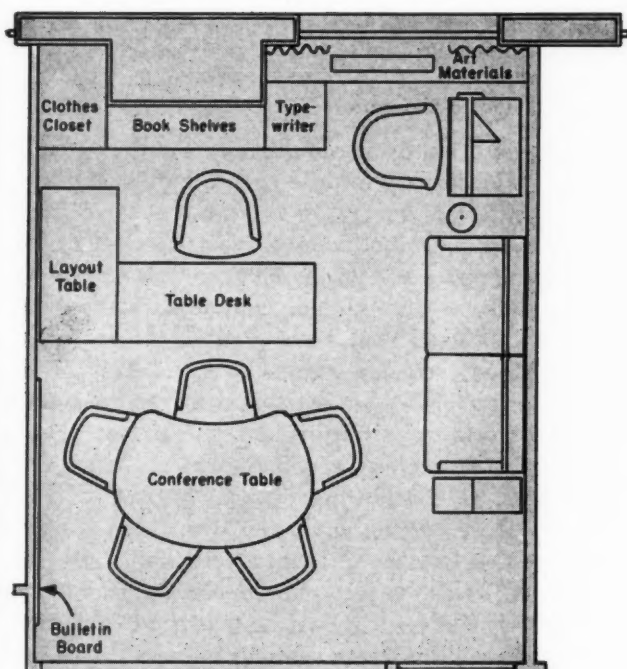
Your office should express your personality — not that of the decorator — and it should give the proper impression of your firm and its spirit.

Something Familiar

When an office is being remodeled, it should be styled around a few items that are familiar. If you have a favorite chair in which you work best, this chair could be copied in materials and fabrics that would blend with the new surroundings. A good decorator even goes to the trouble to find out whether an engineer is happy about the styling of his home. If so, he selects colors and decorative pieces similar to those used there. If the engineer has a wife who has expressed only her own personality in the decoration of the home, the decorator attempts to have nothing in the office to remind the engineer of it. (To gain this bit of domestic information, the decorator notes little references, or lack of references, to the way the wife has decorated the home. If this fails, the secretary is an infallible source of information.)

In selecting office furniture, light tops with darker wood bases are best. A light working surface silhouettes pencils, paper clips, and slide rules and is easiest on the eyes. Metal furniture is not appropriate for an executive office. It is cold to the touch, standardized, and of production line quality.

Furniture should be in scale to the size of the



SUGGESTED OFFICE LAYOUT FOR JUNIOR PARTNER.

office and with the person who will occupy it. For instance, a man who is 6-feet tall would want large, comfortable furniture. If the office were small, he could have the larger-than-ordinary furniture, but to avoid making the place appear to be cluttered the decorator should not select overstuffed furniture.

Color and Texture

Office colors should be limited to pastels. An office is no place to create a sensational effect with modern

oranges or reds. They have no dignity. The best colors are grays, the lightest of greens, beige, or a pale coffee color. Glossy surfaces are distracting. A satin finish is recommended for all furniture and walls. Carpets also should be a solid color and pattern, usually in the colors mentioned.

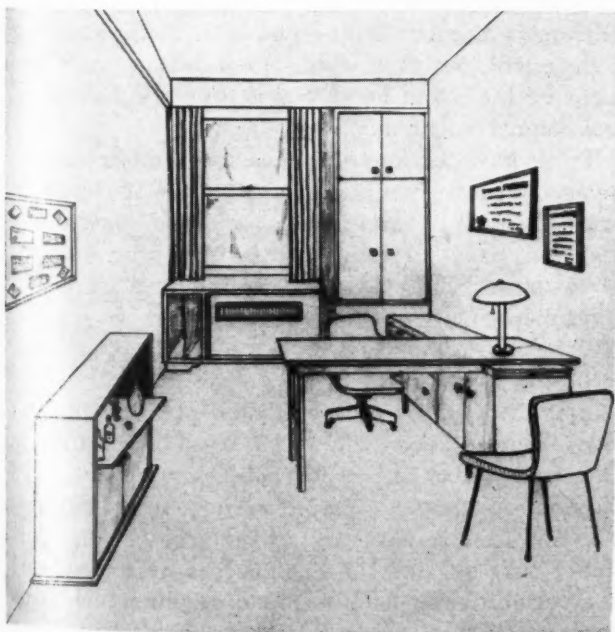
It is interesting to use the products or carry out the ideas of some of the engineer's principal clients. For instance, if I were decorating an office for consultants who planned New York's Seagram Building, I would use bronze fixtures and drawer pulls, and would try to include a painting or color photograph of the bronze skyscraper.

Fitting the Tone

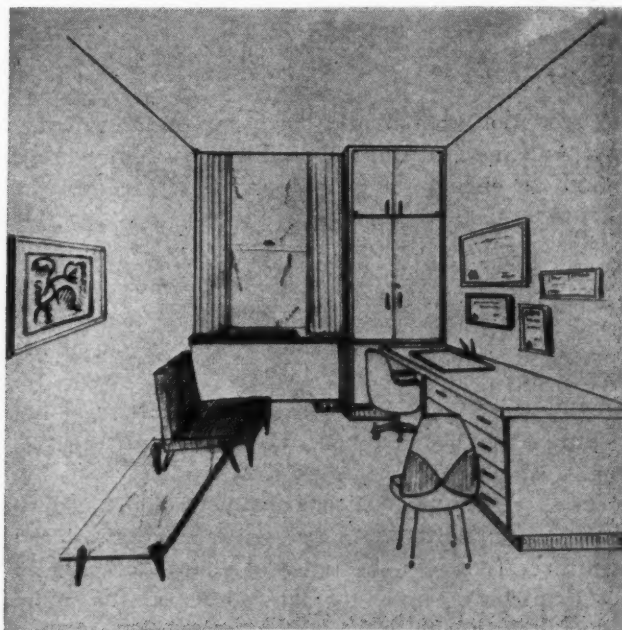
For an old, established firm, the dignity of the organization must be combined with the personality of the engineer. By using muted tones and avoiding ostentatious furnishings, the proper impression can be created. Photos, of outstanding past projects, would be framed in natural wood, with frames of $\frac{3}{4}$ to $2\frac{1}{2}$ inches to blend with the surroundings. And for this office, the use of carpet is essential. It adds an atmosphere that can be provided by no other floor covering.

A younger man, in a growing firm, could use furniture that tends toward modern—or at least contemporary—with touches of bright colors. In this office, pictures of past projects should stand out to show how well-established the young engineer is. To draw attention to these pictures, use mats, but no frames, around the photos. Or, if frames are used, they could be painted to match the walls.

If an engineer specializes in process design, some very interesting pictures can be obtained by unusual



NOTE ATTRACTIVE ARRANGEMENT OF DIPLOMAS AND REGISTRATION CERTIFICATES ON THIS OFFICE WALL.



SAME OFFICE SHOWN AT LEFT WITH A DIFFERENT FURNITURE AND WALL DECORATION ARRANGEMENT.

combinations of photographs of the equipment parts.

Not more than four diplomas and registration certificates should be used in a wall grouping. The shapes and sizes of these documents determine their arrangement. If an engineer wants to exhibit more than four documents, they should be arranged against a large white mat and framed as a single picture. Another interesting arrangement can be made by photostating the documents as a unit and framing this as a single eye-catching, yet not overly large, picture. A variation can be made by leaving the most important document full-size, and grouping the smaller photostats around it.

The secretary's office should be arranged to blend with — but not overshadow — the office of the engineer, the color scheme and furniture matching that in the larger office. And her office is no place to add any personal feminine frills.

Drafting Rooms

Individual preferences also should be overlooked when decorating a drafting area. Here the colors and arrangements should be selected with the needs of the majority and the appearance of whole area in mind. The room should not have distracting decorations or unnecessary furniture, yet should provide pleasant surroundings and a pleasing color scheme. Off-white, or a very light gray, is preferable for walls. These colors offend no one, yet provide good light reflective qualities and a neat appearance.

For the storage of blueprints, I prefer cabinets. If a person has to open a door to get a blueprint, he usually will close the door when he puts it away. I have designed one cabinet, with a honeycomb interior, in which rolled blueprints can be inserted horizontally. Other cabinets permit blueprints to be hung from the top on racks or inserted, unfolded, in drawers.

Reception Areas

A reception area should be no larger than necessary. And the furniture should not be comfortable enough to encourage people to spend the day. In this area, off-white, light gray, pale coffee, or light greens again are recommended.

Conference Rooms

Comfort should be the prime consideration in the planning of a conference room. The furniture should carry out the theme used in the offices, but all chairs should be upholstered. If the room requires pictures, map or charts are suggested. These blend with the business atmosphere, yet do not distract. Quiet patterns should be used in draperies and upholstered furniture. To avoid the noise of chairs scraping or the disturbing shuffle of late arrivers, the room should be carpeted.

Three-strength lighting is preferred. Subdued lights can be used for informal talks, and the bright-

er lights can be switched on when drawings or details are being studied.

How to Select a Decorator

The decorating profession has its share of quacks. All that is necessary in order for a man to call himself an interior decorator is that he have some printed cards. Unfortunately, most decorators' organizations have no professional requirements for membership, so an engineer cannot always rely on recommendations from such groups.

You should select a man who specializes in the decoration of offices. A man who might do a good job of decorating a Victorian home is not always qualified to undertake an office project.

If you are considering several decorators, one way to assure getting what you want is to assign a sample office to each. Give him relatively free rein, and judge by the results. The decorator should not be told, for best results, that he is being tested. That knowledge would create competitiveness that might result in the sample office not being truly representative of his work. On the basis of the preliminary sketches, you can select the right man. Decorators also can be judged by their previous projects.

How the Fee is Set

I charge clients on a time basis, and I think that is the most satisfactory arrangement for both the client and the decorator. (I supervise the decorations before, during, and after the remodeling begins.) Some decorators prefer a time-plus-percentage basis of payment. However, that presents a temptation to purchase the more expensive furniture when perhaps other pieces would fit the room even better.

On all furnishings that he purchases, a decorator receives a discount. Some pass this discount along to the client, but even if this is not done, it costs the client nothing, and he still is getting the benefit of professional selection.

If you have a limited budget, a decorator can be engaged to plan just one of a group of offices. This basic plan, with variations in color and fabric for draperies and furnishings, can be used for any number of offices with pleasing results and a minimum investment.

When a decorator and an architect are working together on the remodeling of an office, the architect usually designs the woodwork, the paneling, and on many projects, even the major pieces of furniture. The decorator is responsible for color selection and the final appearance of the interior.

If you are hesitant about hiring a decorator, remember that he, like the engineer, is an expert but in a very different field — a field in which few engineers are well informed. But again like the engineer, his sole function is to serve his client and get him the most for his money. Usually, he does. ▲▲

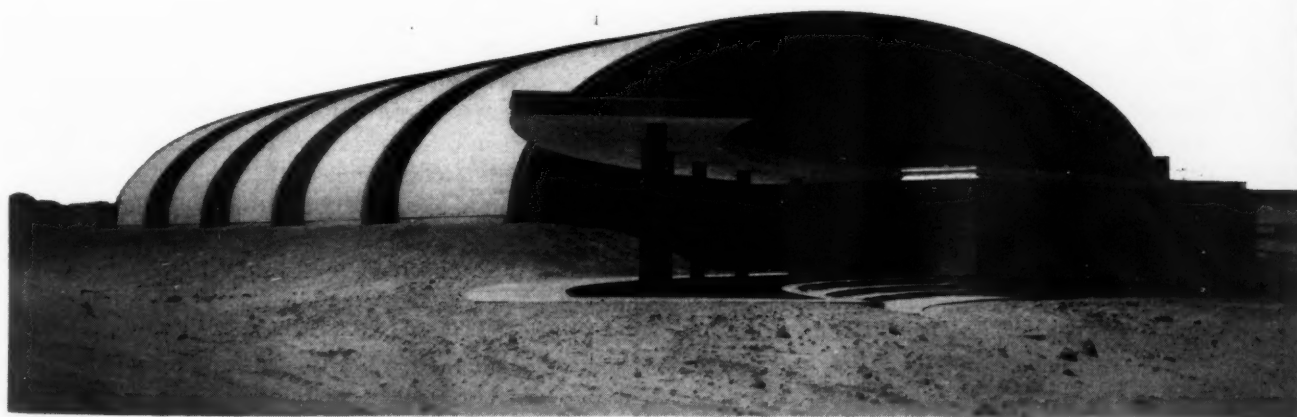
Project Studies

School Engineering

- **Mechanical**
- **Electrical**
- **Structural**

With an Introduction by . . .

HARRY TERRY, Consulting Engineer



GYMNASIUM, WILLCOX SCHOOL, WILLCOX, ARIZONA

HARRY TERRY, Consulting Engineer



Col. Harry Terry, graduate mechanical engineer from Syracuse University, took postgraduate work in sanitary and industrial engineering at Minnesota University and in business administration at New York University. Before establishing his own firm, he was employed as a mechanical and electrical engineer by Marshall and Fox, Chicago architect, and by A. H. Stem, St. Paul and New York architect. Terry began his practice in the St. Paul-Minneapolis area. His work was interrupted by World War I, when he served as a Captain in the Engineers' Corp, and by World War II, when he was a Colonel and consulting engineer to Brig. Gen. A. M. Prentiss on the design of the Pine Bluff Arsenal in Arkansas. The Colonel resumed his practice in New York City, in 1949, but recently moved his firm to new offices in Trenton, N. J. Terry's organiza-

tion confines its activities to engineering design, supervision, and professional reports. Among Colonel Terry's outstanding projects during more than 20 years of private practice are the St. Paul Athletic Club; County Courthouse, Gaylord, Minn.; WISN-TV Studio, Milwaukee, Wis.; Motor Wheel Corp. plant, Newark, Del.; Crucible Steel Co. warehouse, Cleveland, Ohio; Concord Baptist Church, Brooklyn, N. Y.; and New York City Junior High Schools Nos. 74 and 168. Terry is a member of the New York Association of Consulting Engineers, the American Society of Heating and Air-Conditioning Engineers, the Engineers Club, and a number of other engineering organizations.

A RECENT ARTICLE in *Life* magazine, by Dr.



Paul Woodring, discusses the confusion resulting from the fact that "we Americans have never quite made up our minds what we want our schools to accomplish." Naturally this confusion as to purpose and approach in education causes uncertainty as to what schools should be designed and built to do. But whether one approves or not, it is clear that over the past 30 to 50 years the trend in education has followed the progressive approach, and schools today are being designed to include all the features and facilities required for progressive methods of teaching and for extensive athletic and other extracurricular activities. In fact some members of school boards complain that our schools are becoming excessively costly through overdesign not entirely warranted by rational standards of scholarship.

Whether all the features demanded in schools today are necessary, it is a demonstrable fact that methods of construction used in modern school buildings are much less costly than those accepted at the turn of the century. It is not the structural but the mechanical and electrical features that are costly. Yet, even the strongest opponent of progressive education would agree that good lighting, heating, and fire protection systems are essential, regardless of the teaching system used. There is the story about a school on the West Coast that illustrates relative costs. The architect found that the project was going to exceed the available funds. He went to the structural engineer and asked where structural costs could be cut. The engineer pointed out to him that all the structure — walls, floors, and roof — could be eliminated, and the costs would still exceed the allocated funds.

While the story is an exaggeration of the typical, it is certainly true that the general trend in school design is toward a simplified structure that encloses a functional assembly of electrical and mechanical

equipment. It also must be understood that today over 40 percent of the space in an elementary school is used for such features as stage, all-purpose rooms, kitchens, music rooms, library, laboratories, shops, art studios, and home economics rooms. The trend to include space for additional facilities of this nature is still on the upgrade.

Basic Design

Elementary and junior high schools are generally of single story slab-on-grade design, with flat roofs, cinder block interior walls, and wall-to-wall windows. The campus design for single story elementary schools is recommended by many educators and some architects. Whether the trend toward this type will continue depends somewhat upon the opinions of educators and to a large extent upon experience with its use. It has disadvantages in cold climates.

Multistory buildings, where used, generally make no special provision for concealing heating and plumbing lines and conduits so that risers are exposed. Floor construction designed to conceal pipelines generally causes installation difficulties. However, O. Kline Fulmer, of Fulmer and Bowers, Architects of Princeton, New Jersey, says, "Contemporary architecture must complete its cycle, as have other previous forms, both to add ornamentation and to conceal the bones of a structure." So, we engineers may hope to find in the future, provision being made for concealing mechanical and electrical pipelines and ventilating ducts.

Heating and Ventilation

In the slab-on-grade type of construction, in connection with community center or campus layout, the advantages of forced hot water heating and the trend towards its use is one of the significant developments of the past few years. This method of heating can and often does eliminate the need for providing special underground piping trenches.

Space heating requirements for schools remain the same, and although the equipment has been modified and dressed up somewhat, both direct and indirect radiation still is provided in the newer forms of convectors, window-line fin radiators, baseboard radiators, and floor or ceiling radiant panels. Ventilation still is obtained from unit ventilators, which have been redesigned and modernized by the manufacturers but still make use of the same basic principles

At the heart of the heating plant—the boiler room—there also has been very little change. The source of all heat is either the warm air furnace or, more generally, the boiler, and the method of firing is usually automatic using oil or gas burners or coal stokers. The greatest change in boiler design has been the postwar swing from the horizontal fire tube type of steel boiler to the compact Scotch marine type, which has been combined with an oil burner, fans, pumps, and other appurtenances to make a complete package unit. Time alone will prove whether this change will have been advantageous. It is noteworthy that there has been reluctance on the part of several old line steel boiler manufacturers to make the change to package units.

Plumbing Fixtures

There is an increasing use of color for plumbing fixtures in schools. The general preference is for water closets that are wall hung, with flush valves. Lavatories and urinals also are wall hung. The lavatories are equipped with slow self-closing faucets, and the urinals are provided with flush valves. Drinking fountains are used universally, with a definite trend towards electric coolers. Where cafeterias are involved there are always water coolers, and there is tendency to replace corridor drinking fountains with electric coolers.

Kitchens and Cafeterias

Over the past 10 years cafeteria kitchen equipment has expanded to such an extent that it now

includes counters, display stands, protector cases, hot food sections, cashier sections, ice cream cabinets, milk coolers, beverage and dish dispensers, clean and soiled dish tables, prerinse sinks, dishwashers, ranges and ovens, work tables, overselves, saucepan racks, mixers, vegetable sinks, peelers, pot sinks, silver and tray trucks, water coolers, refrigerators, and incinerators. All this can be classified as mechanical equipment.

Lighting

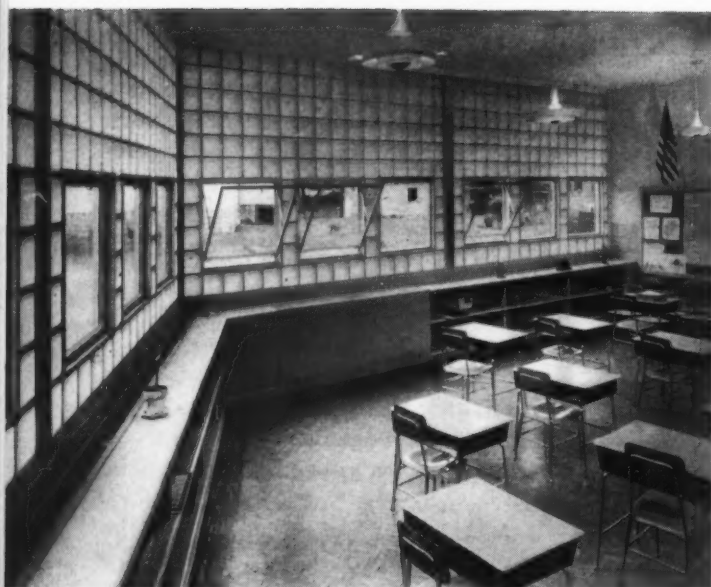
About a half of the classrooms today are being lighted with incandescent lamps on the basis of first cost. Fluorescent units cost roughly \$2.00 per linear foot for installation and \$4.75 for fixtures, which means a typical classroom installation costs approximately \$565.00 in place. Incandescent units can be installed in a classroom for half of the cost of fluorescent units—certainly not over \$300.00. On the other hand, fluorescent lighting, based on a power consumption of 2100 kwh per year (1000-hours operation), as against 4500 kwh per year for indirect incandescent lighting will save \$72.00 per classroom per year based on an energy rate of 3¢ per kwh. This saving would quickly amortize the extra cost of fluorescent fixtures in many areas. As might be expected the trend is toward higher illumination, as illustrated by the table showing the current requirements of New York State.

In large high-ceiling rooms, such as gymnasiums, there are now many installations of color corrected mercury lamps properly controlled by prismatic glass reflectors. Their high efficiency and long life has made them especially popular in cost-conscious districts. This is just the beginning for mercury vapor lamp applications. In engineering drawing rooms there are designs for prismatic lens units with deluxe color corrected 100- and 250-watt lamps applicable to all school areas including classrooms.

Schools generally have a stage in connection with an all-purpose room, an auditorium, or a gymnasium. A few years ago stage equipment included only

SCHOOL LIGHTING REQUIREMENTS IN NEW YORK STATE

Location	Minimum Maintained Foot-Candles	Initial Foot-Candles
Classrooms, study halls, lecture rooms, libraries — on desks, tables, chalk and display boards	20	27
Offices —on desks	20	27
Sewing, drafting, art, and other rooms where fine detail work is to be done — on the work	30	40
Shops, laboratories — on the work	20	27
Gymnasiums, playrooms, swimming pools	20	27
Auditoriums, assembly rooms, cafeterias, and other similar places if used for study	20	27
If not used for study	10	13
Corridors, stairs, passageways, and all indoor areas traversed by students	10	13
Locker rooms and toilets	10	13
Sight-saving classrooms — on desks, chalk, and display boards	40	53



MODERN CLASSROOM IN A PUBLIC SCHOOL. NOTE SILL-LINE HEATING AND 3-RING INDIRECT LIGHTS.

border lights and footlights. Today there is an increasing use of theatrical type switchboards. This is especially true in large high schools where drama courses are taught or where the school stage is used for major productions.

Fire Alarm

A modern fire alarm system for a school makes use of closed circuit supervised boxed-coded equipment of auxiliary type connected to a pedestal type municipal station. With this setup the local alarm operated from any inside station also will operate the municipal alarm system. Kitchen facilities and a boiler room present hazards which should be covered by automatic detection thermostats tied into the fire alarm system. There is an increasing demand by fire chiefs for this municipally connected school fire alarm system.

Large cities such as New York require the installation of sprinkler equipment for schools having stages where scenery is used and stored in an adjacent work shop. Wherever sprinklers are installed, a sprinkler alarm system with control panel and bells are required and furnished under the electrical contract. The general use of sprinklers in schools is on the increase in larger buildings. For single story buildings, however, it is very unusual to find sprinklers incorporated in the design.

Signaling Systems

Signaling systems for schools generally include program or dismissal systems, clock systems, telephone systems, and sound systems. Dismissal systems for small schools may require nothing more

than a buzzer in each classroom, installed in the classroom clock, with the wiring in the clock wiring conduit and a single circuit program instrument. Large schools require program instruments having 4 or 6 circuits. These usually are arranged to operate through a bell control board to permit rooms to be rung selectively or by groups through the program circuits. Plugs permit any room to be connected to any program.

The program or bell system is directly related to the clock system. Of the various types the wired clock system is the simplest, and the synchronous wired system using dual motored clocks has proven to be quite accurate and fairly trouble free. Since each clock is corrected automatically by correction of central station frequency, the need for master clocks and hourly correction is obviated.

In larger towns and cities, where current interruption is infrequent, a manual reset central control is adequate. In remote areas, where interruption is more frequent, an automatic reset control to reset the clocks is more desirable.

Telephone systems currently are considered a luxury, and if a two-way sound system is installed, the telephone system may be unnecessary. However, where the school budget does not include the cost of a sound system, a telephone system may be required. Common talking systems are adequate for between 20 or 30 outlying points, and the simplicity of the system makes it practically service-free. High schools or other large schools requiring more than 30 outlying zones should have an automatic dial-type switching system. Such a system is relatively costly, however, and it does require occasional servicing.

The school public address system in many instances is not included in the wiring contract, but empty conduits for a public address system are today generally part of the work included under the electrical contract. The electrical engineer may be expected to prepare the design and write the specifications. The purchase of the public address system then can be made later, with the cost charged to maintenance funds. Speakers are provided in classrooms, laboratories, art sections, libraries, music and practice rooms, home economics rooms, gymnasiums, cafeterias, and auditoriums. The system will be centrally controlled to provide:

¶ Amplification of recordings at 78, 45 and 33 $\frac{1}{3}$ rpm and sound reproduction in all areas equipped with speakers.

¶ Transmittal of speech originating at the console in the principal's office and its reproduction in all areas equipped with speakers.

¶ Pickup of programs originating in the gymnasium, or all purpose room, and reproduction in all areas equipped with speakers.

Certainly the school of the future will make use of a communications system that will provide a num-

ber of interrelated functions previously available only through the application of a number of individual systems. We visualize a system that will consist of a common denominator electronic network to provide the following functions:

- ¶ Intercom between rooms and administrator's office.
- ¶ Paging and program distribution from the administrator's office to selected classrooms.
- ¶ Secondary fire detection.
- ¶ Emergency signal for evacuation.
- ¶ Selective distribution of signals to indicate classroom changes.
- ¶ The interior facilities necessary for a comprehensive school-to-home network.

Antenna for General Broadcast Reception

Some time ago there was a considerable interest shown by many school authorities in having facilities provided for reception of radio and television. Where reception is good and educational programs available, schools are provided with antenna for both general broadcast and FM reception. Masts are installed on the roof of the school and connected by cable to a radio tuner on a central control rack.

For television reception a master antenna system must be installed that will provide a signal level at all television outlets of not less than 1000 microvolts on all television channels. This assures a 100-percent safety factor over the minimum signal level specified by FCC for stable television.

The greatest interest today is in connection with closed circuit television. Isolated installations have been made and are reported to result in greatly increased efficiency of the teaching staff. The use of closed television in schools is in its infancy, but it appears to have generated so much interest on the

part of educators that we may expect a more general use of the system.

Electrical Sterilization

Sterilization of toilet rooms, lockers, and showers by electric lamps is reported to be on the increase. New York City schools now provide for the installation of sterilizing lamps in toilet rooms. The popularity of this sterilization method probably will depend upon the sales activity of the manufacturers of the lamps.

Year-Round Conditioning

In the trend toward the community center, campus design, consideration must be given to the use to which meeting spaces will be put. If it is known that one or more of the meeting spaces are to be used regularly on a 12-month basis, or if the school year includes many hot days, then this would suggest that the engineer must give thought to year-round air-conditioning.

New control equipment for heating, ventilating, and air-conditioning has resulted in many remarkable achievements in practically every phase of comfort conditioning. New techniques involving automation, instrumentation, and electronic devices are making complete air-conditioning as automatic as heating.

No doubt as materials and equipment developments continue we can expect to see improvements that greatly increase the effectiveness of teaching methods and efficiency of the teaching staff. We can be sure the mechanical, electrical, and structural features of the modern school will permit "more learning per school dollar." From that point on, it is up to the teaching staff and the administration.



HOME ECONOMICS ROOM IN HIGH SCHOOL IN NEWPORT BEACH, CALIF., HAS RECESSED INCANDESCENT LIGHTING FIXTURES.



Junior High School - - Nyack, New York

Built in nine months at a cost of \$17.90 per square foot, the Nyack, N.Y. Junior High School has the distinction of having been occupied less than one year after the bonds were voted. With a capacity of 600 students, the multistory school was the latest structure to be added to a 28-acre hillside area, previously developed with playfields and an elementary school building.

The school is of slab-on-ground and slab roof construction, with hung ceilings. In classrooms, the exposed walls are largely of glass. The cold weather problem created by window downdraft and cold wall surfaces was solved by the installation of unit ventilators with sill-line heating in classrooms. Automatic gymnasium heating or cooling and ventilating is provided by a package-type unit ventilator supplying fresh air through ceiling diffusers and forcing exhaust air out under the stage and through risers to roof ventilators. Locker and shower rooms are ventilated by infiltration, using roof fans to exhaust the air. These areas are heated by automatically controlled cabinet-type units. Corridors with

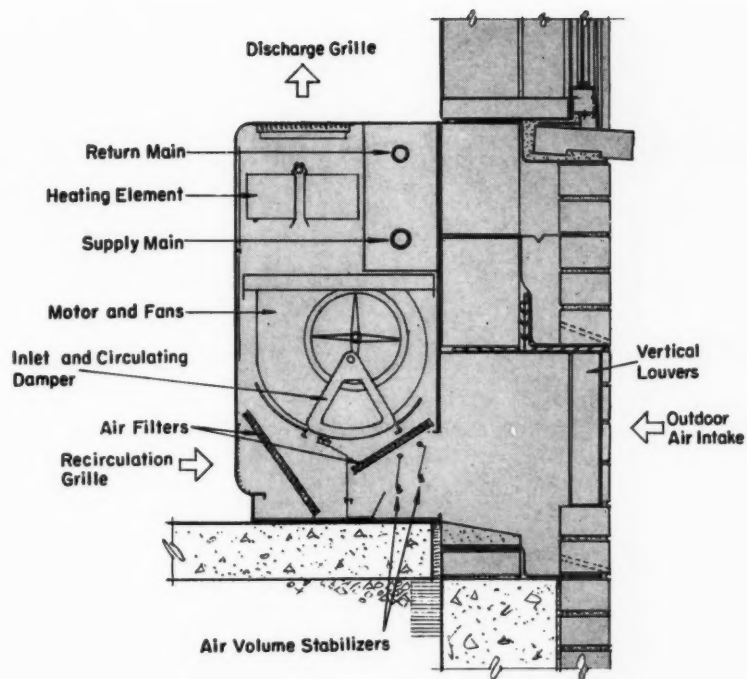
exposed walls have perimeter heating in addition to unit heaters. Roof fans exhaust air from corridors, the cafeteria kitchen, toilets, and showers.

Heat is supplied throughout the building by means of a five-zone forced hot water system. The pipelines feeding peripheral heating units are run along the outside walls, the piping being concealed by sill-line enclosures which run from partition to partition. Feed mains generally are concealed above hung ceilings. Where it is necessary to run heating pipes below the ground floor slab, they are enclosed in oversized mill-wrapped cellular glass pipe insulation mopped with bitumastic enamel to provide an insulated, waterproofed enclosure with space for expansion and contraction.

Classroom lighting is designed for maintained illumination of 37.5 foot-candles and 1000-foot-lambert brightness, 0 to 45 degrees. Lighting fixtures are rapid start three-tube fluorescent ceiling mounted fixtures with glass side panels.

The gymnasium (with stage) is used as auditorium and cafeteria. Incandescent lighting for the

CROSS SECTION SHOWING ARRANGEMENT OF UNIT VENTILATORS AND THE AIR INTAKES.



Harry Terry
Consulting Engineer
Mechanical & Electrical

Saul Shaw & Co.
Consulting Engineers — Structural

Fulmer & Bowers
Architects

stage and auditorium is controlled from a stage switchboard equipped with a dimmer. Stage lighting includes both foot and border lights as well as stage spots and general illumination. Fixtures are gymnasium reflector dome type, surface mounted and equipped with 500-watt lamps. Maintained illumination is 20 foot-candles.

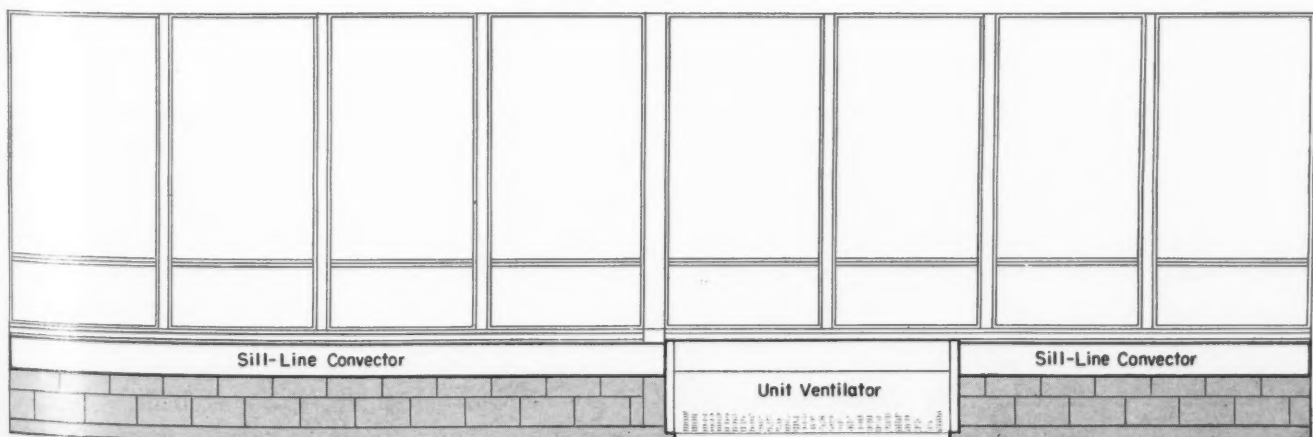
Outside entrance lights and parking lights give adequate illumination of the school grounds. Fixtures at the entrances are cast brass vapor-tight fixtures with 100-watt lamps. Parking lights are aluminum three-lamp fixtures for R-40 lamps.

The public address system is a centrally controlled sound system permitting reproduction and amplification of recordings at 78, 45, and $33\frac{1}{3}$ rpm; reproduction of speech originating at the console in the principal's office; and pickup of programs originat-

ing in the gymnasium. Speakers are provided in classrooms, laboratories, gymnasium, library, and art, music practicing, and home economics rooms.

The fire alarm is a closed circuit supervised box-coded system of auxiliary type connected to a pedestal type municipal station so that the local alarm operated from any inside station also will operate the municipal system. Local alarm for test or drill can be sounded without operating the municipal fire alarm system.

The total connected load of the school building is 381.7 kva. A transformer vault was provided, and utility owned transformers were installed. Primary service to the transformer vault is underground from street lines. Secondary lines from the transformer vault are carried directly to the switchboard in the boiler room.

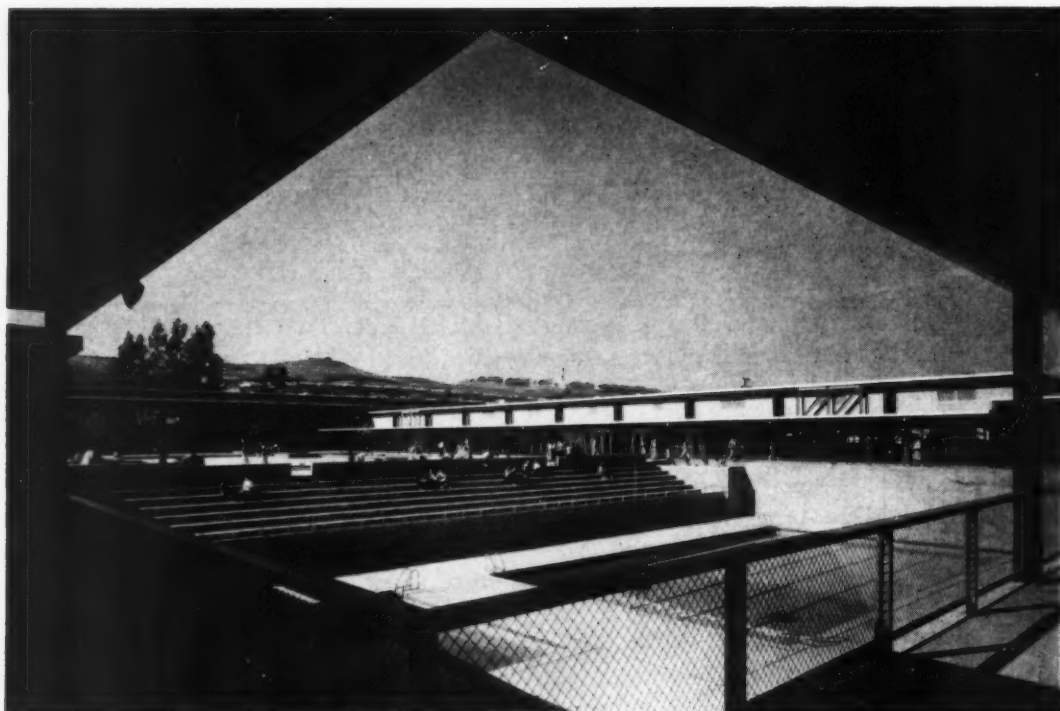


EXPOSED CLASSROOM WALLS ARE LARGELY OF GLASS, AND HEATING COMES FROM SILL-LINE CONVECTORS.



PRIZE WINNING HILLSDALE HIGH SCHOOL USES MOVABLE OFFICE PARTITIONS AS INSIDE WALLS.

G. M. Richards
Consulting Engineer — Mechanical
C. A. Von Bergen & William J. Laib
Consulting Engineers — Electrical
John Lyon Reid & Partners
Architects & Structural Engineers



SCHOOL IS BUILT TO ENCLOSE A LARGE COURT AREA AND TWO OUTDOOR SWIMMING POOLS.

Hillsdale High School - - San Mateo, California

The many architectural awards it has won testify to the excellence of design of the new Hillsdale High School, in San Mateo, Calif. The structural design is unusual in that there are no permanent inside walls (except around the toilets and the boiler room). Instead, walls are 2 $\frac{5}{8}$ -in. thick, movable office partitions constructed of two layers of steel packed with rock wool. These partitions are installed with a clip tying them to aluminum grids at the ceiling. At the floor they are fastened to inserts set in the finish concrete.

The use of movable partitions implies a modular

design, the bay module in this school being 14 x 14 feet. A modular bay is 28 x 28 feet with a skylight on the center line of each quarter point. Rooms are made up of 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 1 $\frac{3}{4}$, or 2 full bays. Smaller areas such as offices can make use of $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a bay. All utilities are designed to serve these modular dimensions regardless of the way the bays are divided by the movable partitions.

With this design a typical classroom (28 x 28 feet) has four skylights. Each skylight is framed with 6-ft fluorescent lighting fixtures, each corner of the frame being a perforated distribution plate for



MODULAR CLASSROOM HAS FOUR SKYLIGHTS BOUNDED BY FLUSH LIGHTING AND AIR-CONDITIONING GRILLES.

heating and ventilation. Each skylight well is topped with a 6- x 6-ft panel of glass designed to admit daylight but to reduce solar heat gain.

The exterior of the building consists of nonbearing curtain walls supported by steel mullions field-welded to a perimeter plate set in concrete. The curtain walls are insulated with fiber insulated panels and two layers of asbestos cement.

There are three 250-hp oil and gas fired hot water boilers (215-220 F) in the boiler room. These heat

the building, supply domestic hot water, and warm the water for the swimming pool.

Two fan rooms, one for each half of the building, supply air to ducts leading to each 28- x 28-ft bay. There is a mixing damper for each bay to vary the quantity of heated and bypassed air as called for by a summer-winter thermostat. Wide flexibility was designed into this system because of the peculiarities of the California weather. It is necessary to supply some heat almost every morning in the calendar year. However, between 10 a.m. and noon this must be changed to cooling if the day is sunny. In fact, it is not uncommon at 10 a.m. to have some of the inside bays heated while cool outside air only is supplied to the rooms exposed to the morning sun.

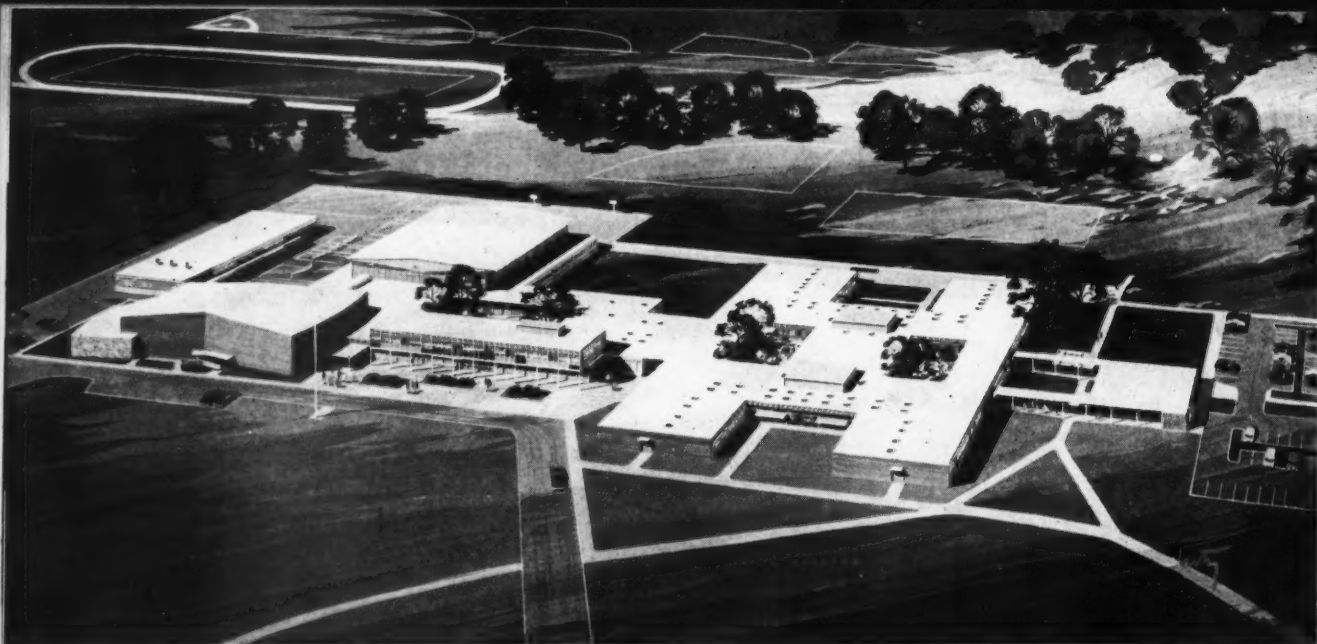
The heating and ventilating fans supply a total of 304,000 cfm with exhaust through registers in the skylight wells. Mechanical exhaust is used in all areas in which there are fumes or high humidity conditions. It has been found that the heated air stream is carried to the floor line without objectionable drafts or any short circuiting to the relief or exhaust grilles.

The design of the Hillsdale High School was so successful that it is being used again for the new Mills High School, in Millbrae. Only a few design changes are being made in the new school. Skylight wells have been reduced in depth by one foot and reduced to 5 x 5 feet at the top while maintaining the 6- x 6-ft ceiling openings. Lighting fixtures have been moved up into the skylights. Less glass has been used in the outside walls. The same method of air distribution has been maintained.

The Hillsdale High School has 120/208-volt electrical distribution, but this has been changed to 270/480 volts for the new Mills School. Both schools use 24-volt switching to avoid the need for rigid conduits in the movable partitions.

EXTERIOR IS MOSTLY GLASS WITH STRUCTURAL COLUMNS OUTSIDE OF CURTAIN WALLS.





THIS RENDERING SHOWS NORTH HIGH. SOUTH HIGH SCHOOL IS SHOWN IN THE PHOTOGRAPH BELOW.

North and South High Schools - - Hagerstown, Maryland

Kluckhuhn, Cobb & McDavid
Consulting Engineers

Beall & LeMay (South High)
J. Gibson Wilson, Jr. (North High)
Structural Engineers

McLeod & Ferrara
Architects

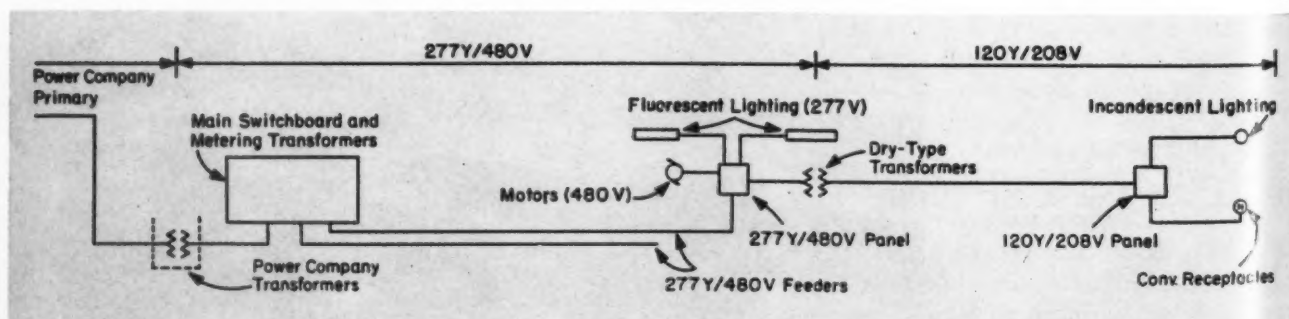


While Hagerstown, Md., was in the midst of a two-school project it was announced that the county had been selected by the Fund for the Advancement of Education, and the Radio, Electronics, and Television Manufacturers Association for a subsidy to finance a five-year comprehensive test of closed circuit television for teaching.

At the time of the announcement, South High was nearly complete, so TV distribution wiring was in-

stalled in troughs around the outer perimeter of the various buildings, taking advantage of the available space at the bar joist ends. Conduit stubs were taken off from these troughs and led down columns and in wall corners (where possible, in walls) to telephone-type outlets.

Being forewarned at the time North High was still under design, the engineers found it practicable to place distribution lines in the walls along the



SCHEMATIC DRAWING OF THE LIGHTING DISTRIBUTION SYSTEM USED IN NORTH HIGH SCHOOL AT HAGERSTOWN.

inner sides of the classrooms. In addition, outlets, in the form of two-gang boxes, were included — one side for the usual telephone-type outlet for television receiver connection, the other side containing a duplex receptacle for 120-volt power.

At present, teaching material is broadcast from studios in the Board of Education Headquarters, in Hagerstown. Current facilities permit transmission of three programs simultaneously to the schools through Telephone Company coaxial cables. RF frequencies conforming to commercial broadcast channels are used. The receivers are of the usual commercial type, with no modification required.

Currently, both the elementary and secondary schools in the City of Hagerstown are served. Future plans now in process include increased studio and transmission facilities to provide five or six simultaneous programs and extension of the system via both coaxial cable and microwave link to all 47 schools in the county.

Electrically, North and South High Schools differ slightly. South High is served by a 480-volt, 3-phase, 3-wire system. This class of service is distributed throughout the school with banks of single-phase, dry-type transformers providing 120/208-volt, 3-phase, 4-wire power. It is calculated that this system saved approximately \$25,000 comparing only wire saved and transformer expense. If conduit labor and switchboard were included, the savings would be far in excess of this figure.

At North High, utility company service was found to be available at 277/480 volt, 3 phase, 4 wire. Because of this, a much larger percentage of the school is provided with fluorescent lighting, operating on 277 volts. It was found that this considerably reduced the cost of the system, since branch circuits as well as branch panel boards were reduced in both size and number.

In South High, the science, mathematics, home economics, and other classrooms were provided with fluorescent lighting. Careful study was given this system, and it was decided to use two-lamp parabolic alzak aluminum troffers. To economize in the mounting of the units, it was specified that they be enclosed in plain, white enameled steel boxes,

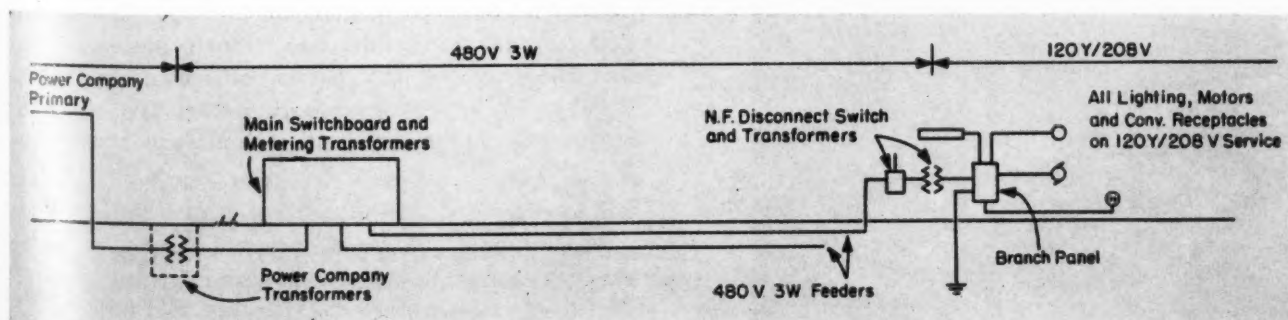


TELEVISION IS USED IN BOTH SCHOOLS. HERE STUDENTS WORK IN GENERAL EDUCATION LAB.

surface-mounted. With light floors and furniture, the "bounce" lights the ceiling evenly and pleasantly—without any disturbing bright-and-dark areas. The character of the fixture minimizes brightness beyond the 45-degree cutoff point, resulting in a very comfortable installation. Lengthwise shielding is accomplished by the addition of louver-baffles of the same material as the reflector.

In North High, the same plan was extended to all classrooms.

Both school buildings make use of high temperature water for heating. Heat is distributed through a split system consisting of fin tube radiation at the outer wall and central air handling units serving large areas with tempered air. The system provides ventilating capacity more than double that normally available with classroom unit ventilators and provides for evaporative cooling when ambient humidity permits. From the central air unit, tempered air in winter and cool air in summer is distributed through plenum spaces above the corridor ceilings. The high temperature water system includes three-way mixing valves actuated by outdoor conditions to maintain proper temperature in the local systems.



SOUTH HIGH DOES NOT HAVE THE 277-V SUPPLY FOR FLUORESCENT LIGHTING PROVIDED IN NORTH HIGH.



BRICK AND GLASS FACADE OF THURSTON HIGH IS MODERN YET CONSERVATIVE IN ITS APPROACH.

Lee M. Thurston High School - - Redford Township, Michigan

Giffels & Vallet, Inc.
L. Rossetti
Associated Engineers & Architects



The Lee M. Thurston High School, in Redford Township, Michigan, is a building of modern but relatively conservative design built to handle 1500 students. It is a brick structure covering about 150,000 square feet and costing about \$15.80 per square foot. The exterior walls of classrooms are primarily windows, and the swimming pool room has one side of sliding glass doors so that in warm weather it becomes a semioutdoor area.

The buildings are heated by low pressure steam with a vacuum condensate return system. The steam is generated in a central boiler room by three, 15,000-sq ft boilers fired with heavy (No. 6) oil. Steam and water distribution lines are routed in

FILTERED AND HEATED AIR IS DELIVERED TO THE GYM FROM SEPARATE UNITS LOCATED IN EQUIPMENT ROOMS.



PRIDE OF THE SCHOOL IS THIS INDOOR POOL WITH SLIDING DOORS THAT CHANGE IT TO A SEMIOUTDOOR AREA.

pipe trenches, the lines being sized to accommodate future additions.

Classroom heating is accomplished with unit ventilators discharging into the rooms. Return air is removed through grilles in the window sills exhausting into a plenum below the windows, a portion of this exhaust air being discharged through wall louvers to the outside. Fresh air is brought in through the wall, through the unit ventilators, and blended with return air to secure the desired intake mixture.

In areas where power exhaust is required, as in the chemical laboratory, the unit ventilators are supplemented with finned pipe radiation and the window sill grille eliminated.

Auditorium and gymnasium heating and ventilating is handled by heating and ventilating units located in nearby equipment rooms, heated and filtered air being delivered through a duct and diffuser system.

Electric service is furnished by an underground primary to a 500-kva, 4800/120-208 volt, 3-phase, 4-wire transformer bank in the building. General lighting is fluorescent, rapid start, the classroom areas using suspended louvered-type fixtures. The office and work areas have recessed troffers.

The clock and signal system is automatically corrected and electronically controlled. There is a central radio and P.A. system serving the school with



AUTO SHOP (IMPORTANT IN THIS DETROIT AREA) IS SPACIOUS AND WELL LIGHTED.

separate systems in the auditorium, boys' gym, girls' gym, and swimming pool room. The house telephone system covers classrooms and offices and provides for audible paging. Conduit is provided for a future television antenna system.

Perimeter court, and parking lot lighting is time switch controlled. The electrical contract cost for the complete building came to approximately \$1.50 per square foot.



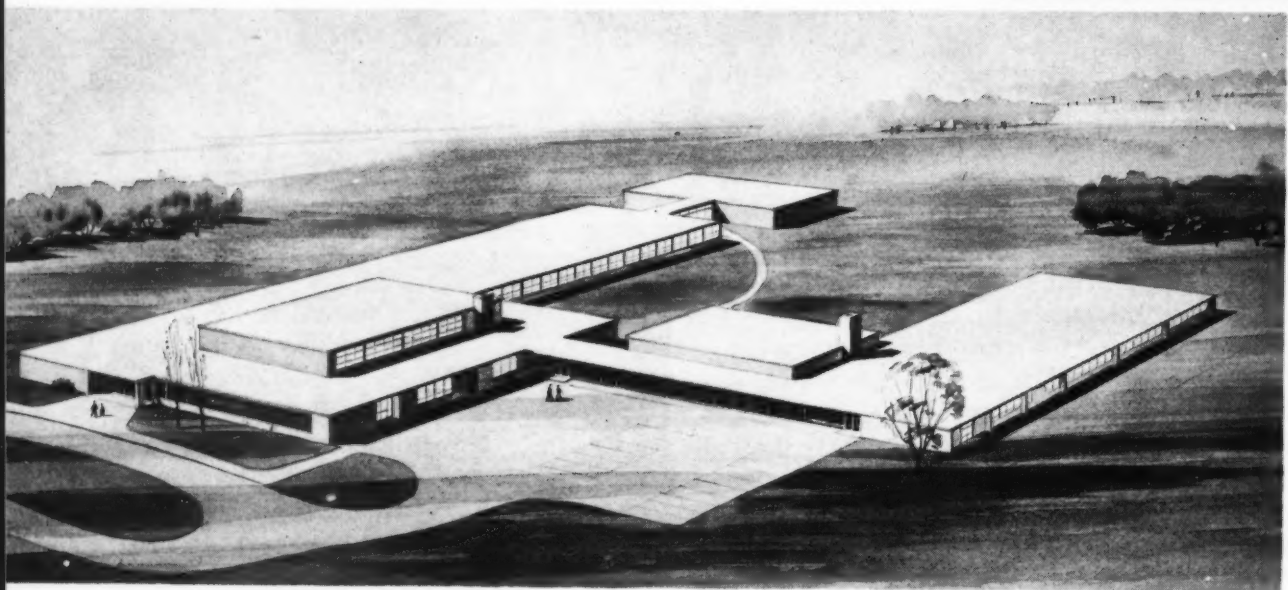
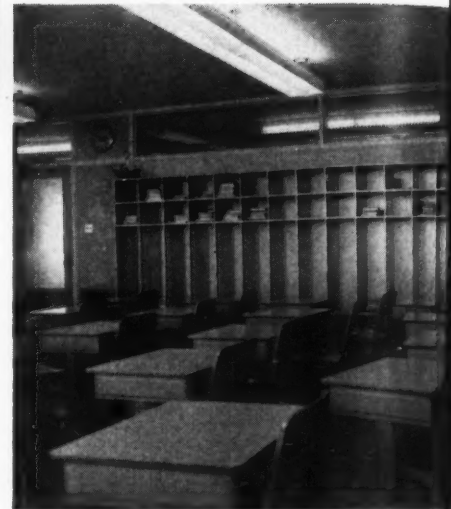
CLASSROOM AIR IS SUPPLIED BY UNIT VENTILATORS AND EXHAUSTED THROUGH ROOF. LIGHTS ARE UNLOUVERED, LOW BRIGHTNESS FIXTURES, INSTALLED PERPENDICULAR TO WINDOWS.

Bogen & Alston

Consulting Engineers

Frederic P. Wiedersum Associates

Architects — Engineers



Cuba Hill Road School - - Elwood, Long Island, N. Y.

Six classrooms, two kindergartens, and one playroom have just been added to the three-year old Cuba Hill Road School, in Elwood, Long Island.

The classrooms and playroom were added as a new wing to the main building, and the two kindergartens were attached to the existing classroom area. A comparison of mechanical and electrical facilities in the main building and the new addition will give some idea of recent design trends.

An innovation in school lighting was specified

for the new addition — 60-inch, 40-watt, low brightness, unlouvered fixtures, pendant mounted in continuous rows at right angle to the windows. These were tested against the 48-inch, 40-watt rapid start units installed parallel to windows in the older building. Tests showed no appreciable difference in light distribution at the working level and no objectionable glare.

There were no savings in cost of initial installation when compared to the older lighting system, and

lamp replacement will be about twice as expensive. However, success of the test with reference to lighting level and absence of glare now has led to further tests of low brightness units without louvers, side shielding, or top channel reflectors. Success with these tests could lead to a considerably reduced fixture cost and perhaps over-all savings.

Included in the electrical design were provisions for parking and building security lighting. Security lighting consists of strategically mounted 150-watt sealed beam floodlights around the perimeter of the building. This arrangement has proved to be a great deterrent to vandalism.

The original building is heated by a forced warm air furnace with hot and cold air ducts under the center corridor. These ducts are connected by branches to the exterior wall of each classroom. Air is discharged through grilles located beneath the windows.

Since the furnace capacity could not be increased sufficiently and space was not available in the heater room for additional equipment, a new heating plant was constructed in the addition. A series-type hot water system, with 50 F temperature differential and forced circulation was used on the new wing. Initial costs were comparable with a warm air system, and pipe tunnels or trenches were eliminated.

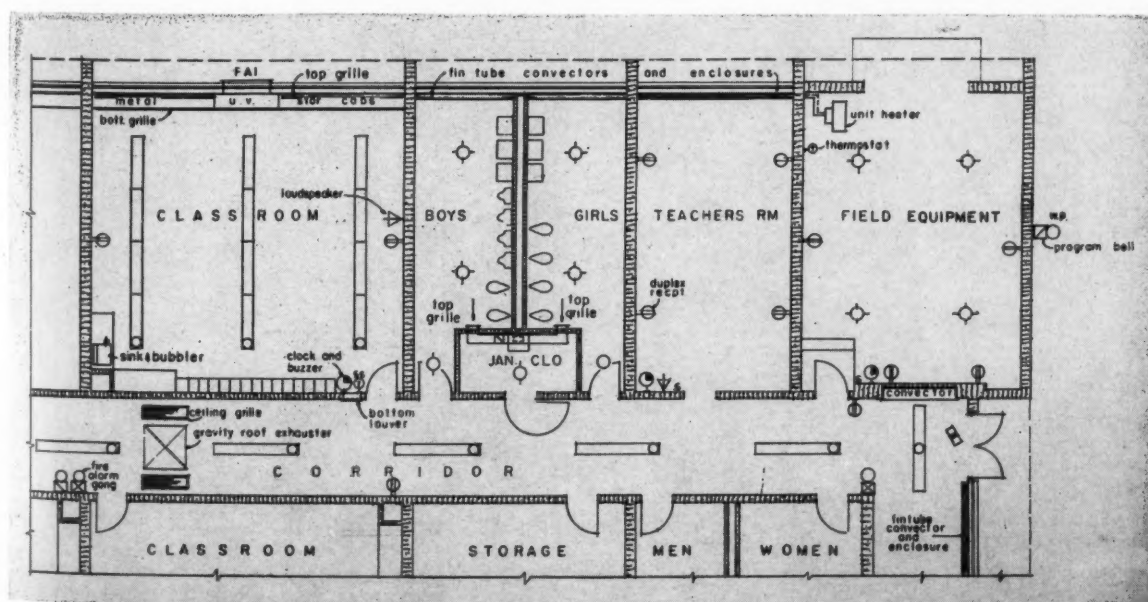
Water is heated by a cast iron boiler using a rotary type burner to fire unheated No. 5 fuel oil. Boiler water temperature is varied and controlled by an outdoor master thermostat. A centrifugal pump, backed up by a standby, circulates water continuously during the day cycle and intermittently during the night.

The hot water supply and return mains are bare pipe run along the exterior walls. They are covered by standard metal storage cabinets with top and bottom grilles. Unit ventilators are used in the classrooms and playroom, with finned pipe convectors in the corridors and other spaces. In spaces without unit ventilators, there are dampers on the enclosures to permit local temperature control.

The existing pneumatic-type temperature control system was extended to provide a clock controlled day-night zone for the new addition. Unit ventilator fans run continuously during the day cycle and intermittently during the night cycle. These ventilators admit a variable amount of outside air to maintain a fixed temperature for the air entering the heating coils during the night cycle. The mixed air thermostat is set for about 60 F so that the ventilation requirements of the New York State Education Department are met. The code requires approximately 6 cfm of outside air per occupant when outside temperature is 0 F, this to be progressively increased to 10 cfm per occupant at 35 F.

Air for ventilation is supplied through the unit ventilators in each classroom, exhausted through wall louvers to the corridor, and then drawn outside through gravity roof ventilators located above corridor ceiling grilles.

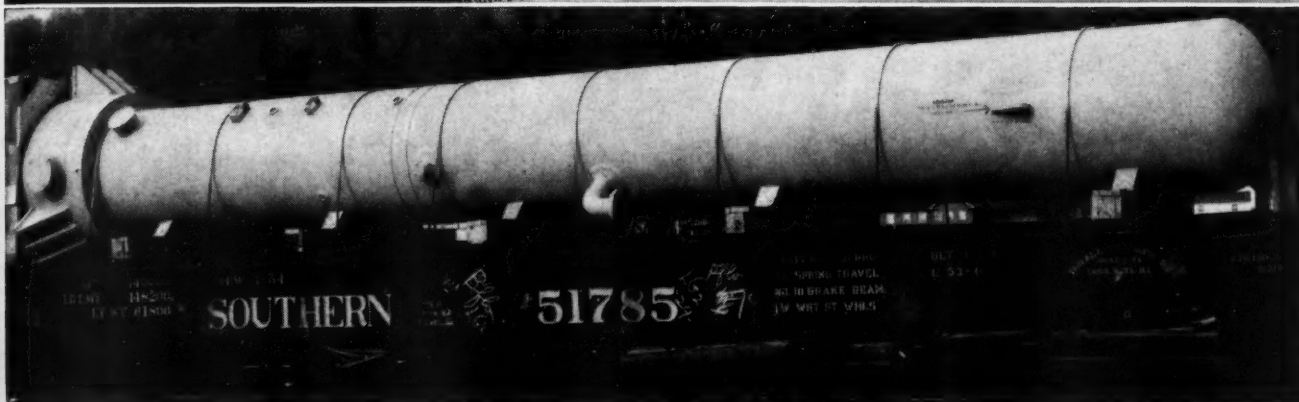
Experience on this as well as other school additions indicates that the engineer on school projects should give considerable thought to the demands for expansion. The basic electrical and mechanical services should be selected at the time of the original design to permit the addition of more classrooms without duplication of equipment.



DRAWING OF HEATING, VENTILATING, AND ELECTRICAL SYSTEMS IN CUBA HILL ROAD SCHOOL.

FEDERAL PACIFIC LAUNCH





FIRST ALL-WELDED FEEDWATER HEATERS

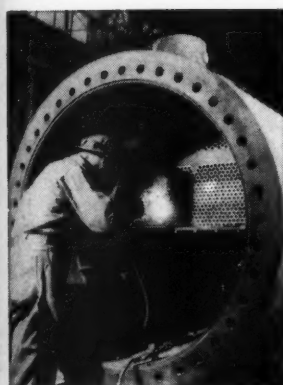
► A few years ago, an all-welded feedwater heater for 3600 psi and 790F would have been called a fantastic dream.

Yet six all-welded feedwater heaters in this pressure-temperature range are now proving their worth in the Linden, N. J., Generating Station of the Public Service Electric and Gas Company. Designed and manufactured by the Yuba Heat Transfer Division, formerly the Heat Exchanger Division of The Lummus Co., these heaters represent one of the many "firsts" contributed by this organization to the progress of the power industry.

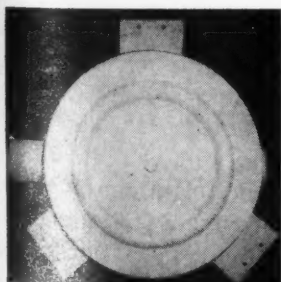
In the heater shown above, two 50-inch-diameter cylinder sections of $1\frac{1}{8}$ -inch carbon steel were welded together. The open ends of the U-bends are welded, not roller-expanded, into the tube sheet (see upper small photo). Heads are sealed by a steel torus ring welded to channel cover and channel (see lower small photo).

The all-welded design minimizes the leakage which occurs in the conventional bolted and gasketed construction under high temperatures and pressures. Results are reduced maintenance and downtime.

This all-welded construction has been so successful it is certain to be specified for practically all future installations. Yuba engineers would be pleased to work with you. Call on them.



Workman welding copper-nickel tubes to foot-thick steel tube sheet with 140-monel electrodes. Under destructive testing, rolled joints and tubes welded with cupro nickel rods leaked at elevated pressures, but tubes welded with 140-monel electrodes were leak-proof at 9600 psi.



End view showing torus ring welded to channel and channel cover. Access to head is obtained by cutting ring with special tool; torus ring can be re-used. Conventional split key ring assembly taking the load on the cover is retained.

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Negotiating Foreign Contracts

RICHARD D. HARZA

Vice President and Business Manager
Harza Engineering Company International

Richard D. Harza graduated from Northwestern University in 1944 and received his Master's Degree from the same school in 1947. During 1945-46 he was an Ensign in the U. S. Navy. In 1947 he joined Harza Engineering Co. and has had experience on design and construction of dams and power plants, irrigation projects, and reclamation schemes. During this period he has carried out engineering assignments in Greece, Turkey, France, Iraq, Pakistan, India, Suriname, El Salvador, and the Belgian Congo. He holds a Professional Engineer's license in the States of Illinois and Washington and is an Associate Member of ASCE.



DURING THE YEARS since the War, there has been a remarkable increase in the foreign work undertaken by American consulting engineers. A glance at the passenger list of airlines flying even the remotest parts of the globe usually will reveal at least one American engineer on his way to or returning from a mission. This increase in foreign consulting assignments is the result of the new economic pattern developing in former colonial areas; the heavy reliance of undeveloped areas on U.S. financing; the increased appreciation of American technical knowledge and methods; and an increasingly high regard for the American consultant.

Often the client is justly proud of the achievements of his own local engineering organization, but he desires outside consulting help to undertake new and larger projects and at the same time further develop the capabilities of his own engineers. It is here that the qualified American consultant can render some most beneficial services.

Preliminary Negotiations

My own experience abroad has been limited largely to consulting work on large river projects, most of them located in the technically undeveloped countries of Central and South America, Africa, the Middle East, and Asia, but this type of work is so typical and so broad that my observations should apply to other fields of consulting services.

Frequently it is found that foreign industrialists or government officials have little experience in

handling and administering American consulting engineering contracts. In some instances the foreign official's only contact with American consultants has been through a Marshall Plan or Point IV type of foreign aid agreement, and these agreements represent American Government practice rather than the general practice of American consulting engineers. It is necessary for the consultant to be aware of this and be patient and helpful throughout the negotiations. While certain customs and practices have developed in other countries regarding engineering services in general, the client really is looking for helpful suggestions and guidance that will lead to the establishment of a workable consulting contract substantially along American lines. The ideal result is a useful and workable agreement carefully combining the elements of standard American consulting practice with certain special clauses recognizing various local conditions and requirements.

Explain The Professional Nature

It is well to start emphasizing even in the initial contact with the client the professional nature of the consultants' services. Once this is established the contractual negotiations will be much simplified. The difference between a consulting engineer and a contractor (primarily with reference to bidding for professional services); questions of performance bonds; the consultant's authority and responsibility for technical control of the work; and the need for prompt payment of consultant's invoices, all must be understood in light of the professional position of a consultant—a position that distinguishes him and his work from the builders and suppliers with whom foreign officials are accustomed to dealing.

Great assistance in establishing and explaining this professional aspect of consulting engineering services can be had by referring the client to the publications covering professional practice and fees as issued by various engineering societies. Correspondence or discussions with the International Bank for Reconstruction and Development have been useful in establishing the importance of competent consulting engineering services engaged on a professional basis.

Model Contract

Frequently, a model contract, prepared by the engineer and submitted to the client either during the proposal stage or during the preliminary negotiation stage, can be helpful in clarifying the consultant's position and the reasons for the various contractual provisions. At the same time, it affords the client a framework within which he may insert special conditions he desires. The contract should be simple and straightforward. No condition or requirement should be stated more than once in the contract. The contract should be prepared in English as well as in the local language before it is

signed. A simple outline of a contract which has been found very effective has four major headings as follows:

- ¶ Definitions
- ¶ Scope of Engineering Services
- ¶ Compensation
- ¶ General Conditions

The definitions should specify the parties to the contract; the project involved; the intent of the agreement; and special definitions such as direct salaries, direct costs, overhead, and fee.

Scope of Engineering Services

It has been found desirable to describe in detail the full scope of services which the consultant can provide and deems desirable. The client then can delete any of these engineering services that he does not want included in the contract. A comprehensive scope of engineering services would include the following items:

- ¶ Appraisal report
- ¶ Project planning report
- ¶ Contract documents
- ¶ Construction documents
- ¶ Supervision of construction and initial operation of works
- ¶ Special services
- ¶ Annual inspection

Compensation

Generally it is desirable for consultants working in foreign countries to be compensated on a cost-plus fee basis. This transfers the risk cost item directly to the client and relieves the consultant of the necessity of increasing his billing by a considerable amount to cover the risk of defaulted payments, contract termination, rising costs, political difficulties, and currency fluctuations. An effective basis of compensation for work of rather clearly defined scope has been to include full compensation for all direct salaries chargeable by the consultant to the work, plus a surcharge on these direct salaries to cover consultant's overhead. To this is added reimbursement to the consultant for all direct expenses of the project, and finally a fee fixed at a given percentage of the estimate of construction cost. Where the scope of the work cannot be fixed in advance, the fee can be related to the amount of work the consultant and his staff perform rather than to the estimated cost of the work.

Foreign clients are anxious to know how much the engineering work on a project is going to cost them. This very natural desire to plan and budget expenses and hold down total project costs may cause the client to request a ceiling figure on engineering costs. For report work it may be possible and even desirable for the engineer to commit himself to such a ceiling figure. He may prefer a lump sum compensation covering all costs and fees rather



than a "cost plus with ceiling" arrangement. When the engineering services enter the design and construction phase, however, lump sum payments or ceiling amounts frequently become undesirable or impossible. There are two reasons for this.

¶ The scope of the engineering work cannot be fixed in advance.

¶ The client's objectives are not necessarily served by minimizing or arbitrarily limiting the costs of the engineering work.

On river projects, for example, the necessary amount of engineering effort is dictated by such factors as geology, hydrology, earthquake characteristics of the area, natural building materials available, and economic requirements of the area. Financing and political conditions also can affect the amount of engineering work required. Since few of these factors can be evaluated adequately in advance of the actual engineering and construction operations, it is impossible to tell in advance how much engineering work (and therefore how much engineering expense) will be required for a successful project.

Agent of the Client

It must be remembered that the engineering consultant is the agent of the client and he must directly represent the client's interest in all legitimate matters within his area of engineering competence. As Daniel W. Mead, the late noted authority on American consulting practice said, "The client must place his trust in the personal honesty, business integrity, and professional ability of his engineers."

In addition, it must be recognized that while the engineering cost of most large projects usually runs between 5 and 10 percent of total project costs, yet the function of the engineer is to conceive, design, detail, and supervise the construction of the entire project. With this in mind, the great danger of ar-

bitrarily limiting the amount of engineering funds, and therefore engineering effort, available to a project can readily be appreciated. Indeed, a considerable increase in engineering effort (special designs, studies, research, redesigns) often will return itself many times in the form of reduced project cost or increased project value. Lump sum compensations or ceiling fees can prevent the engineer from performing his proper function and his duty. It is shortsighted and inconsistent to write a contract under which the engineer would lose money by making special studies and designs that would save his client much larger amounts of money.

The basic economic law — "you get what you pay for" — cannot be abrogated simply by arbitrarily limiting the engineering funds available. Placing a ceiling on engineering funds is also placing a ceiling on the quality and economy of the project. Inherent in this matter are many of the same dangers that come with "free engineering" as offered by some manufacturers and some contractors.

Collections and Credit

Consultants frequently have encountered difficulties in connection with late payments from foreign accounts. Several contractual devices can be employed to overcome this. The consultant can require that advance payments be made to his American bank account before undertaking any work. Then as long as a positive balance is maintained, he can draw his compensation when due. A second and perhaps more widely used device is the irrevocable letter of credit. Under this system the client makes an advance deposit to an American or other mutually agreeable bank. The bank is bound to make immediate payment to the consultant upon submission of his invoice. The detailed invoice is forwarded to the client, and corrections and adjustments can be made periodically without delaying the flow of funds required to reimburse the consultant's costs.

A third protection against late payments, which has met the approval of some foreign officials who have found the letter of credit system undesirable, is to place an interest charge on all payments more than 30 days late in reaching the consultant. It is interesting to note that this method is used in the contract form for consultants published by the Rural Electrification Administration of the United States Government.

The general conditions contain clauses requiring the mutual cooperation of both parties to the contract. It is desirable here to set down general statements indicating that the consultant is responsible for the solution of the technical problems of the project. The liability of the engineer in connection with faulty performance, errors, or omissions on his part should be clearly set forth as being limited to his fee and exclusive to his own costs. Clauses covering conditions under which the contract can



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Standard Contract Agreement

American consulting engineers are not alone in their need for a good contract for use on foreign projects. European engineers, who have handled, over the years, many projects beyond their own national borders have long been conscious of the need for the establishment of a contract form suitable for international operations. The major European contractor association (International Federation of Building and Public Works) and the International Federation of Consulting Engineers (FIDIC) now have reached an agreement and have adopted a Standard Form of Contract for civil engineering construction. This agreement was established just a few weeks ago in Zurich, Switzerland, Mr. Julian S. Tritton signing for the Engineers and Mr. Norman Longley signing for the contractors. This new Standard Form of Contract is said to make available an equitable document which deals fairly with all parties—client, engineer, and contractor. It should be of great value to consulting engineers to have this Form available for the guidance of less experienced foreign administrations in the proper use of the services of consulting engineers.

This Standard Form of Contract was drawn up by European contractors and engineers for their own use, and is based on European practice. American ideas are not involved because no American consulting engineers' association currently is affiliated with the International Federation of Consulting Engineers. Nevertheless, European practice is very close to ours and the document can be of considerable value as a guide.

There is an arbitration clause in the contract under which the parties agree to use the International Chamber of Commerce Court of Arbitration in cases requiring conciliation or arbitration. Fortunately, the Chamber has a working agreement with the American Arbitration Association and the Inter-American Commercial Arbitration Commission.

Copies of the conditions of contract are obtainable from the Association of Consulting Engineers, 36 Victoria Street, London, S.W. 1.

be terminated or assigned to other consultants are in order here. An arbitration clause to be used in event of disputes is also desirable.

Pitfalls of Foreign Practice

Certain pitfalls are almost universally encountered in connection with consulting engineering services in foreign countries. As has been suggested, a number of potential difficulties and misunderstandings can be avoided if the professional nature of the consultant and his services is explained early in the negotiations and further established in the written contract. It should be pointed out that the consultant is independent of any manufacturer, supplier, or building firm, as well as any governmental agencies. It should be further explained that the consultant must be granted full authority to carry out his function of technical designer and watchdog of the project. The consultant's responsibility to report to and guard the interest of the client should be set forth.

Many foreign clients are very anxious to develop their own and their associates' abilities in the technical fields. For this reason, they frequently want to send trainees to the American office of the consultant and in some instances will wish to have the American consultant set up a small design or supervisory office in the foreign country with a top staff of American engineering experts available to train local engineers. These objectives are understandable and even laudable, but disappointment may result if the client fails to realize that a consultant (if his services are in demand) cannot put many of his key assistants on a remote project for long periods.

One of the greatest benefits a consultant can bring to a project is his ability to apply the time of one or more of his experienced engineers to the engineering problems as they arise and for as long as their services are needed. When the problem is solved, these necessarily expensive engineering talents must be shifted to other projects. Obviously, this can best be done in the consultant's home office, and flexibility would be seriously impaired if most of the consultant's key engineers were on some permanent, remote station. Still it is believed that American consultants will do well to attempt to provide some home office training and some on site engineering services when the client desires them.

Salaries and Cost of Living

Frequently clerical accounting and approval procedures in a foreign country are at least equal in complexity to our own. It is believed that discussion of this matter in the early negotiations, pointing out that the consultant must pay his payroll and other bills promptly regardless of when he receives payment from the client, will be helpful.

Many foreign governmental organizations have a tendency to resent local representatives of an



Precast Floors and Roof on Precast Frame

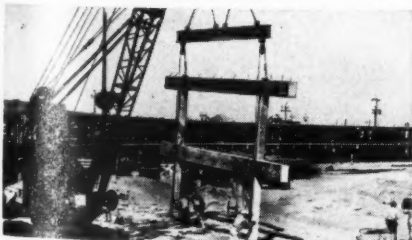
The new Seahorse Hotel in Galveston, Texas is unusual because it is all precast concrete. The frame is formed of 51 concrete bents cast on the site and erected as shown in the photo below, left.

The second floor and roof are 6" x 16" precast Flexicore units, which clear span an average of 13 feet between bents. The Flexicore slabs were left exposed for guest room and sun deck ceilings, and were cantilevered to provide covered walkways. Flexicore units are hollow-cast concrete slabs that

can be designed for clear spans up to 26 feet for floors and 30 feet for roofs.

The Seahorse Hotel is owned by the Beach Corporation of Galveston. Thomas M. Price was the architect and R. L. Reid the structural engineer.

A six-page descriptive folder on this project showing plans, sections, and details is available to architects, engineers and contractors. Write or phone any of the manufacturers below or The Flexicore Co., Inc., Dayton, Ohio. Ask for Flexicore Facts No. 77.



Left: Erection of precast bent. Center: Flexicore slabs used for second floor and roof. Right: Flexicore exposed for guest room ceiling.

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The Flexicore Co., Inc.; 2-color, full page, AD 2-57A, Nov. '57; Architectural Record, Consulting Engineer



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American consulting firm because of the relatively high salaries involved. It has been pointed out that a capable resident manager may receive a dollar salary higher than even the Prime Minister of certain of the host countries. Explanations of the prevailing wage of qualified engineers, higher American living costs, and overseas differential payments required to attract qualified engineering personnel may help. Also, the local government officials often forget pension and security benefits associated with their salaries, which the consultant cannot hope to offer his employees. However, it has been found necessary on some projects to cover local representative's salaries out of a special monthly retainer fee established for the duration of his services. This way the consultant can avoid having the actual salary figures of his top representatives in the foreign country appear in the contract.

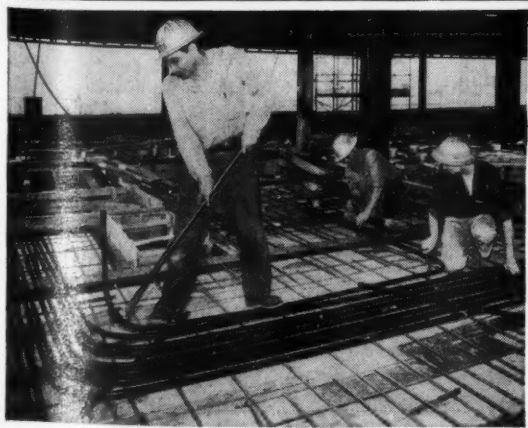
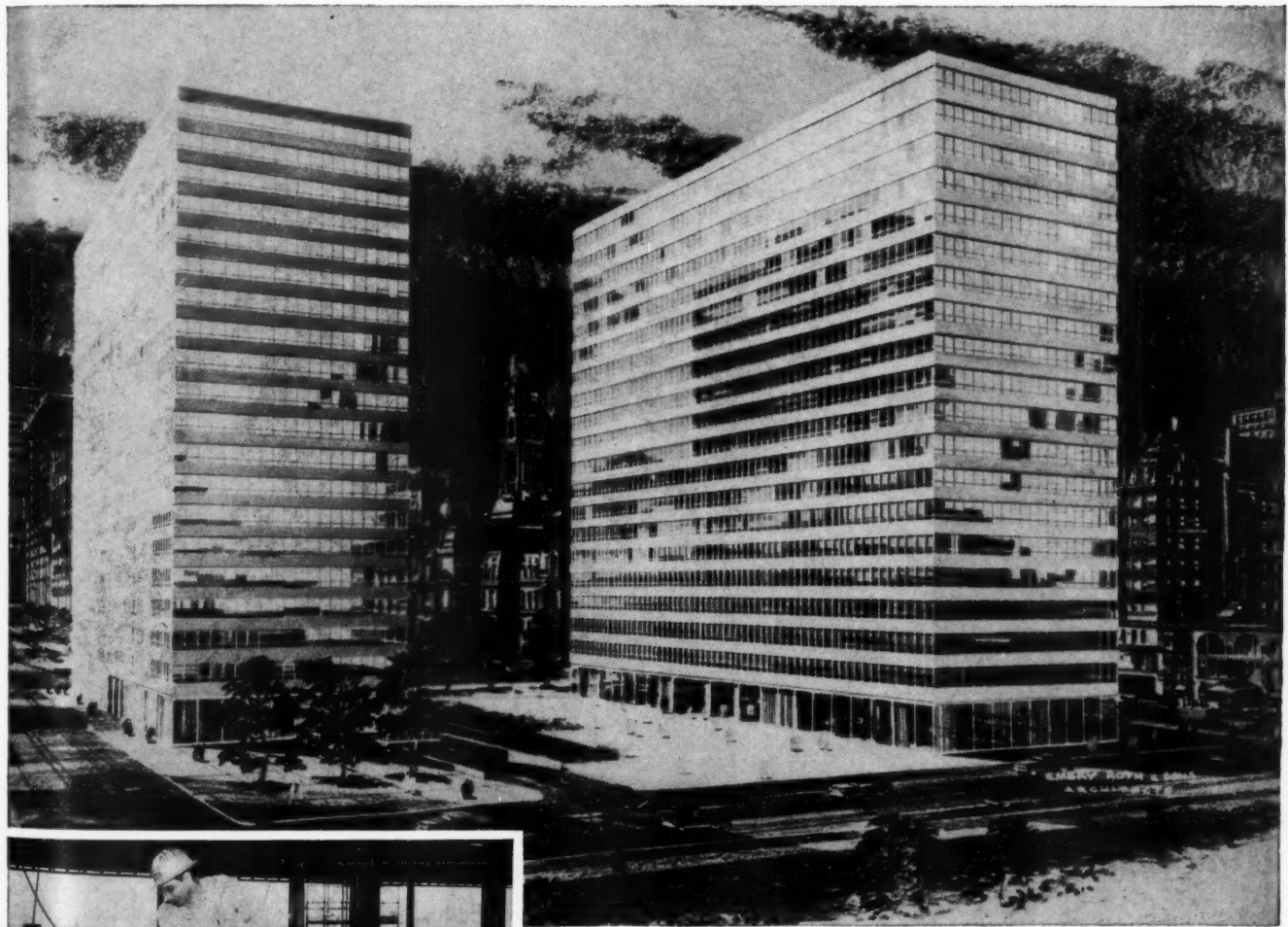
Regarding the salaries of the home office staff of the consultant, it has been found desirable to provide the client with a copy of a recent engineering salary survey. This gives him assurance that the consultant is only paying the necessary going wage and not loading the payroll at the client's expense. With a view to the great differential between American wages and those prevailing in many foreign countries, this documentation of American practice is extremely important.

More Overseas Work

In view of the rapidly increasing demands for technical improvements across the world and the prominent position of American technology, it is probable that American consulting engineering firms will be doing even more work overseas in the future. It is felt that American consultants can do the world profession a service by establishing consulting engineering contracts that will be fair to both client and consultant and that will provide a framework within which the job can be done efficiently and satisfactorily. A certain amount of guidance and leadership can be given by American practice. Tolerance of local anxieties, problems, and aspirations is necessary. But with this awareness, and with the traditional American ability to get things done, great technical achievements will continue to be made abroad with the help of American engineering consultants.



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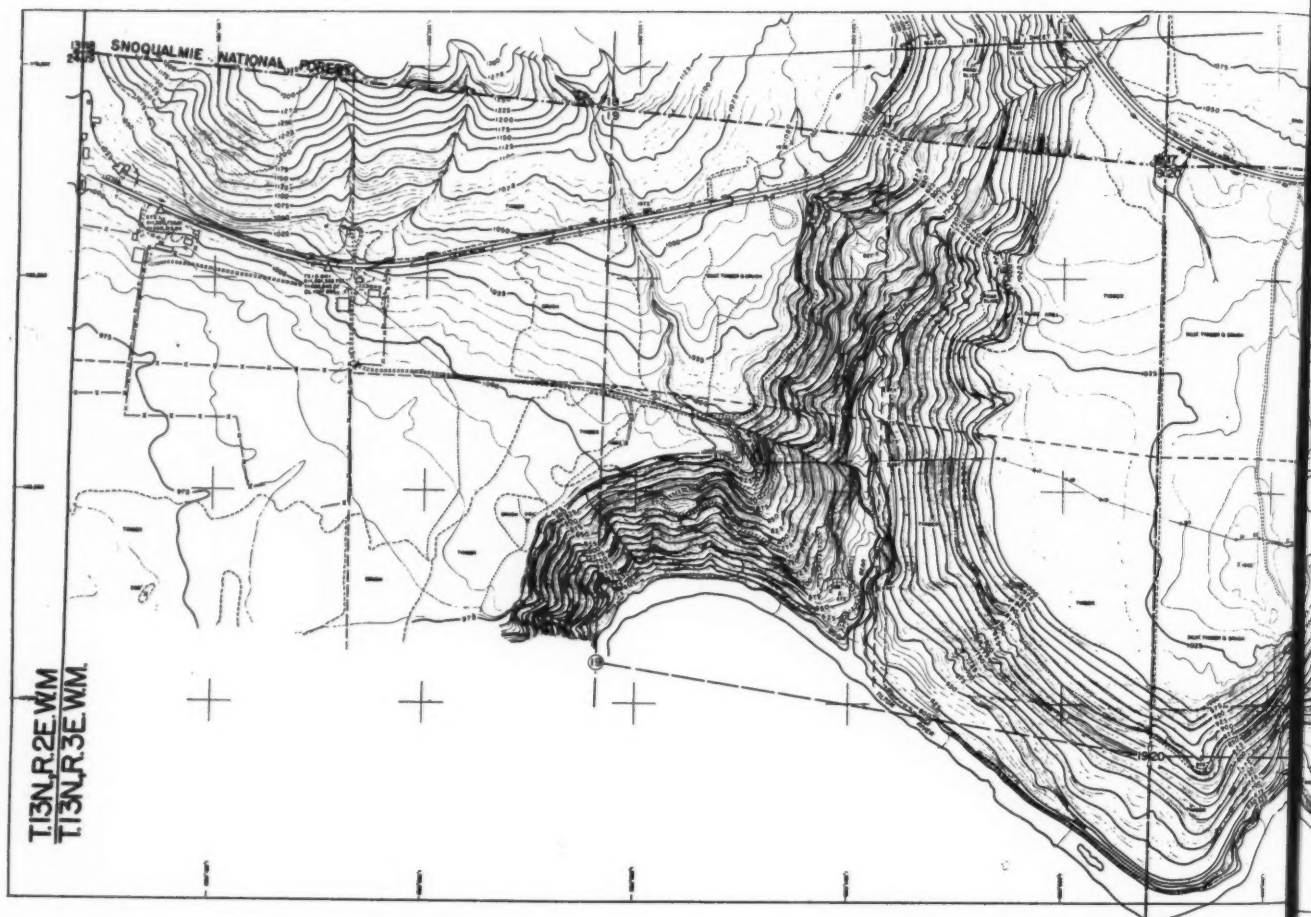
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THIS MAP WAS MADE FROM EXPERIMENTAL PROJECT DATA COMBINING FIELD WORK AND STEREOGRAPHY.

Aerial Surveying of Wooded Areas

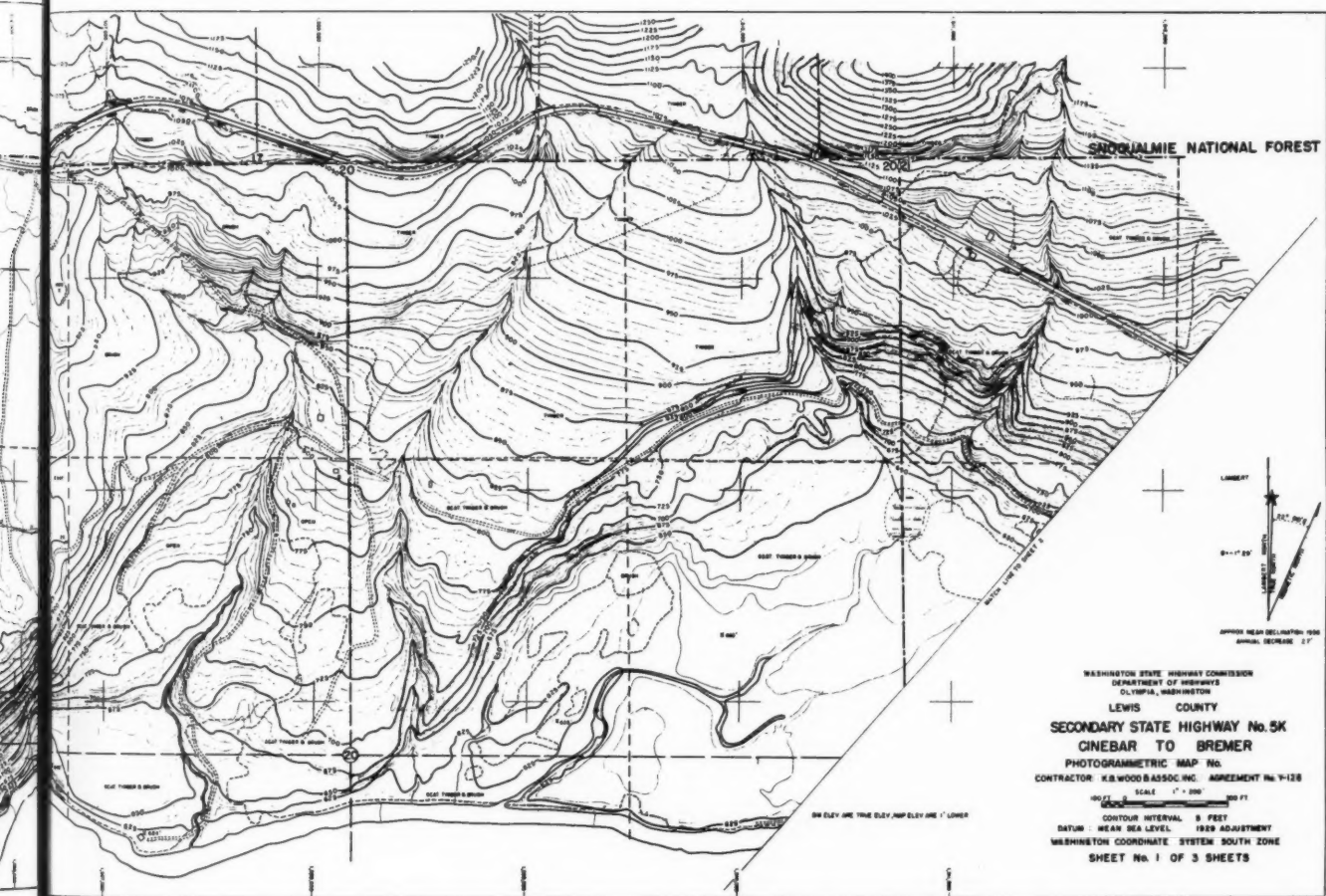
KENDALL B. WOOD, President
K. B. Wood & Associates, Inc.



Kendall B. Wood, the principal owner and manager of K. B. Wood & Associates, Inc., Consulting Engineers, holds a Bachelor of Arts, a Bachelor of Science, and a Master of Forestry from the University of Michigan. He also attended the University of Freiburg, in Germany, from 1932 through 1933. From 1937 through 1946 he was associated with large lumber companies, starting his career in private practice in 1946. Mr. Wood is a registered engineer in Oregon and Washington and a registered land surveyor in California. He is a member of the Professional Engineers of Oregon, Society of American Foresters, American Society of Photogrammetry, and Oregon Technical Council.

IT IS NOT UNCOMMON for many people to assume that a new technical concept is a cure-all for every problem within its range. This is certainly true for stereophotographic methods of map making. When a few projects proved successful, everyone began to feel that it should be used universally. Those of us

Cp exclusive



in the firm of K. B. Wood & Associates, who have pioneered photogrammetry in the northwest, from its inception after the War, know its limitations. As engineers and topographers we realize that any instruments, field and office, contain their own instrumental standards of accuracy, and stereophotographic methods also are limited by the ability of the human eye to see. We have encountered these difficulties in mapping the heavy coniferous timber in the northwestern part of the United States.

The "C" Factor

The "C" factor of a stereotopographic instrument is a measure of its accuracy of plotting in relation to the flying altitude. This term might be modified to denote the plotting accuracy of objects visible with the human eye on an aerial photograph. Timber, brush, and other types of cover obscure the ground and pose limitations to the "C" factor method of determining accuracy of an instrument. Even the height of wheat in the fields is a factor of accuracy when plotting one- and two-ft contours.

In the northwestern part of the United States, particularly from the Cascade range to the Coast, other factors also affect accuracy. Principal among these other factors are the limited good flying weather and the deep, dark canyons and sharp, high ridges which

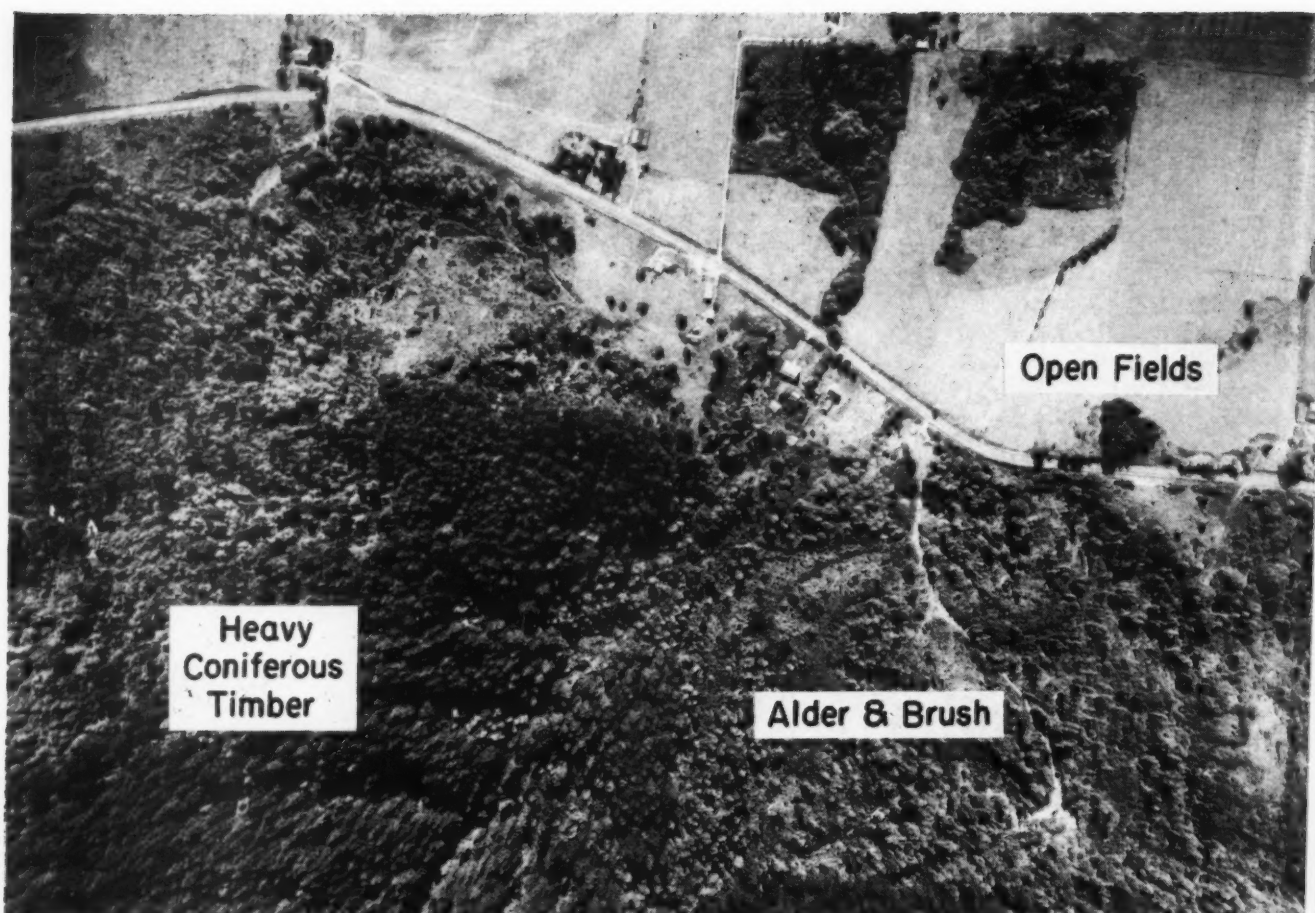
cause extremely varied lighting conditions. At high noon there are shadows in some of the deeper, narrower canyons. The timber and brush cover plus the limited lighting conditions often produce photographs with much less contrast than those sharp, hard photographic models typical of some of the eastern Oregon or Washington country. These factors also limit the accuracy of stereoplotting.

Special Difficulties

Since a good portion of the topographic work we have undertaken is in the northwestern timbered area, we have been keenly aware of all special problems of topographic work in timber areas. Many different procedures have been tried but all of them fall logically into two categories.

- ¶ Methods and procedures for estimating height of timber from the photographs for the purpose of introducing greater accuracy in reconnaissance maps.
- ¶ Methods and procedures for combining stereocompilation with field work.

Experiments have been made by photographing at different altitudes. In some instances we have flown at five different levels in order to select a flying height at which the ground profiles can be best interpreted underneath the timbered cover. For reconnaissance mapping of 10- and 20-ft contour in-



THIS LANDSCAPE IS TYPICAL OF THAT ENCOUNTERED IN THE EXPERIMENTAL PROJECT AT BEAR CANYON, WASH.

tervals, our principal conclusion is that the C factor has very little bearing upon selection of flying height for reconnaissance topography and timber. The greatest source of error is not in the instrument but in the interpretive errors of the compiler. For this reason we have decided that the flight should be at an altitude that makes photo interpretation of timber height easiest. At too low an altitude, the timber causes confusion of the stereomodel, and it becomes difficult or impossible, to fuse a stereomodel. The trees tend to cross rather than fuse. For this reason it often is necessary to fly at higher altitudes than the C factor would dictate.

Other developments along this line include the use of tables for measuring the relationship between crown diameter of the trees and total height. Some valuable aids to the compiler have resulted from this study. Finally, it has been found that special training is required for compilers for this type of work. Training, which involves both field experience in the timber and continued experience compiling timbered models in the office, is necessary.

Other Means Required

For detailed standard map accuracy projects, these reconnaissance methods of developing photo interpretation are of some help but do not solve all prob-

lems. Other means are required to combine field and office work to the best advantage.

The first attempts at developing procedures for field and office work were started in 1950-52, in fulfilling several contracts for the State of Washington. The purpose of these attempts was to preannotate the photography during the course of the preliminary field work to aid the stereocompiler. The field man took the photographs and noted on them:

¶ Telephone lines, fences, power lines, and roads, which were obscured or partially obscured by the timber.

¶ The average height of the trees as observed from the ground.

¶ Draws and creeks which were difficult to find on the photograph by stereointerpretation.

¶ Other peculiarities of topography which might be of aid to the compiler.

This preannotation was most helpful to the compilers, and this procedure now is incorporated in all stereophotographic work we do in timber.

In 1953, under another contract with the Washington Highway Department, we added actual field compilation of areas where the timber was particularly difficult to interpret. A great deal of money was spent in this work, and the profiles on these contracts proved that the operation gave excellent ac-

curacy. However, the costs were very far out of line when compared with general photogrammetric work, and the method was abandoned in later portions of this project.

At the time this work was being conducted, it was felt that considerable time was lost through lack of close liaison between the field and the office. The tendency was for the office to leave some of the areas blank, which might have been contoured by stereographic means had the operator been able to get a few profiles in the area to aid him in interpretation of the ground. We decided that the work fell into one of three classifications:

¶ Areas that can be stereointerpreted directly without additional field aid.

¶ Twilight areas in which stereocompilation could be conducted but field checks on the operator's work are necessary, during the course of the work.

¶ Areas of extremely tall, dense timber, where strictly field work must be used.

In addition, it was found that there are many areas where photogrammetry can be used to set up controls for field mapping, provided the field work is done in close liaison with the plotting. For example, in order to start out a field mapping crew it is necessary to establish control from the existing ground control set up for photogrammetry. Had the field

work been undertaken in liaison with the compilation work, points of known position and elevation could have been dropped around the field completed areas on good photo image points. Then field crews would not have had to go back to set their own controls for field mapping.

Experimental Project

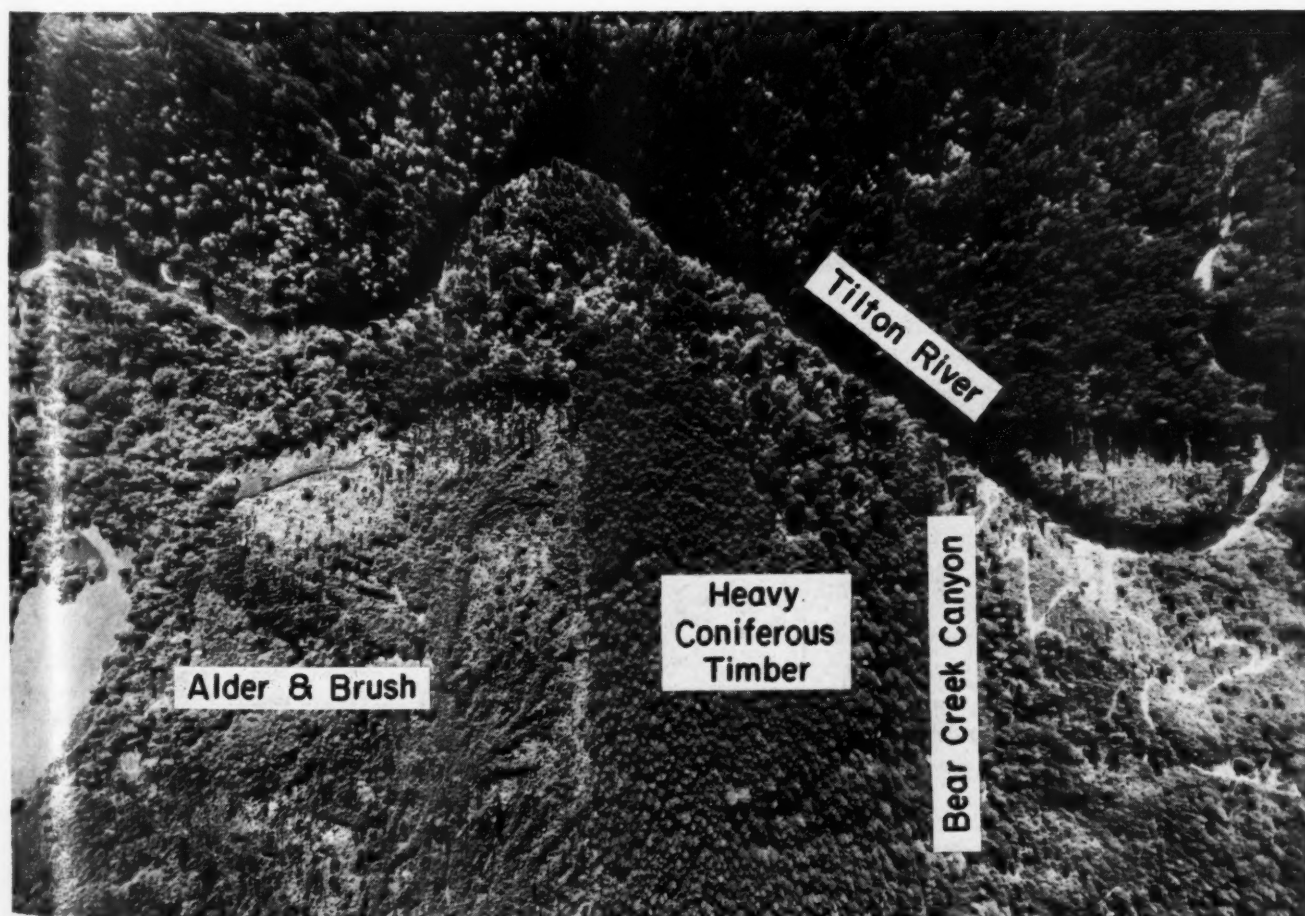
The results of this study led this company to propose to the State of Washington, in the fall of 1955, that an experimental project be set up in which stereocompilation could be brought in close liaison with field mapping. A contract was negotiated, in 1955, for an area approximately four-miles long, covering three square miles. It is situated in the vicinity of Morton, at the Bear Canyon crossing of State secondary highway 5K. The objectives of the survey were to:

¶ Set six brass cap survey monuments on positions defined by the State.

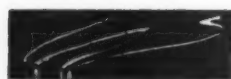
¶ Obtain horizontal and vertical positions on these stations.

¶ Make a topographic map with five-ft contours on which one inch equalled 200 feet.

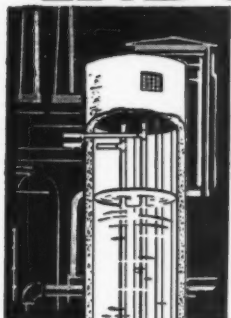
The area was approximately 25 percent covered with a 200-year old stand of Douglas fir timber and 50 percent covered with a dense stand of alder with



WAYS TO ESTIMATE TIMBER HEIGHT ARE ESSENTIAL TO AERIAL SURVEYS IN WOODED COUNTRY OF THIS TYPE.



INDUSTRIAL

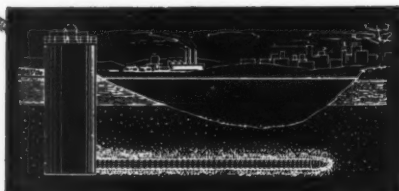


Water... a job for the **RANNEY** METHOD

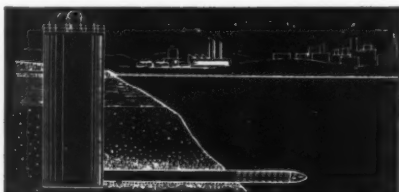
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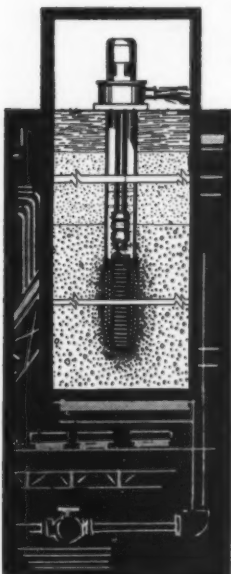
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an under story of heavy brush. About 25 percent was open field.

In order to obtain the best possible liaison between stereocompilation and field completion work, a three-projector multiplex machine was set up in a 24-ft steel trailer equipped with two-way radio so the multiplex operator could be in immediate touch with the field crew for spot checking areas on the photographs where interpretation was difficult. The compiler also was able to operate as an office engineer for assembling and combining field sheets where ground mapping was accomplished. In this manner his time was fully utilized even though the field work occasionally lagged behind the stereocompilation operation. Work was started in the fall of 1955 and completed in January 1956. The weather during the course of the operation was typical of fall and winter west coast conditions, with a good deal of rain, snow, and some extremely cold weather.

The area was flown in two separate strips at a scale of 1:6000, with a six-inch precision mapping camera. Ground control consisted of a traverse run through the center of the area tied to a primary traverse station on the west end and tied for azimuth only by solar observation on the east side.

An attempt was made to run the traverse not along existing roads, but through the center of heavily timbered area, giving additional tie-ins for field mapping. Levels were run along the existing highway and closed in a loop back along the bottom of the Tilton River, giving good wing point control for levels and also numerous tie-in points for field work. Levels also were run along the traverse, providing a vertical tie-in at the center of the project.

Prior to going to the field, the project was set up on a multiplex long bar, and the entire project was extended. Although scale points existed from field work on almost every model, it is usual procedure with this company to run through stereotriangulation on multiplex to check the picture pointing and to set up additional scale controls on every model.

Triple Approach

On November 25, the portable multiplex unit and the compilation crews went to the field, and a location for the portable unit was found where good communication was available to all parts of the area. The timber and ground cover conditions logically caused the work to fall in three categories:

¶ Open fields and areas where stereocompilation was possible. (This work could have been done at the office in Portland.)

¶ Areas where exact interpretation of the ground was extremely difficult. The usual procedure in these areas was to stereocompile the entire area, dropping good scale and vertical points on good photo image points on the ground for tying in field work. The field crew then would run strips between these points, correcting the topography where the stereo-



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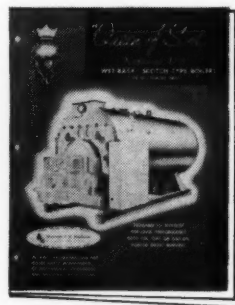
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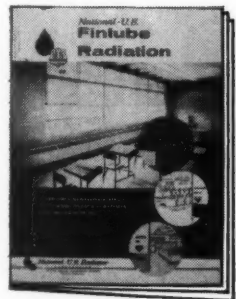
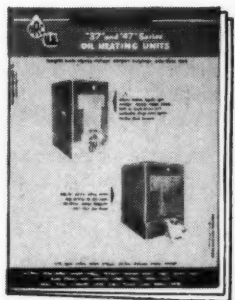
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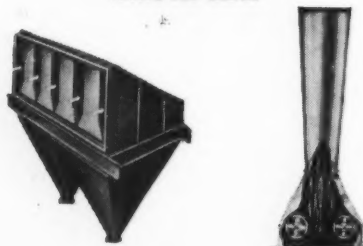
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interpretation was in error. In other areas, field strips were run prior to the compilation, and the photo compiler would use the field strips for orienting and adjusting his interpretation of the ground.

¶ In areas of high timber no stereophotographic work could be done except to drop points along the edges of the area for tying in the field mapping.

The field work was done by using a staff compass line between either photo control points or ground control points. For distance the chain was used in some instances. In others, where the distances between controls were not too great, a Wild range finder was used and the distances adjusted on tying into final control. An Abney level was used for purposes of carrying levels on the field strips. The accuracy of this type of field procedure was found to be within map accuracy wherever the distance between tie-ins, either to photogrammetric control or ground control was not in excess of 1500 feet.

Because of the bad weather conditions, field sketching was not done. A set of field notes with spot elevations was carried in the field book and the topography plotted and interpreted from these field notes. There is no question but that the work could have been done more rapidly and possibly with slightly better accuracy had field sketching been attempted. However, with continuous rain and snow it would have been very difficult to maintain a sketch board in the field.

Cost Was High

Stereocompilation was completed on January 10, 1956. Drafting, in accordance with standard State of Washington specifications, was undertaken as soon as the compilation work was completed, and the work was delivered on January 20. The cost of undertaking this work was excessive because it was an experimental operation. Numerous procedures had to be developed, some of them retained and some of them rejected. A total of 1228 man-hours of work was expended on the job.

This can be reduced to 308 man-hours per lineal mile, or 410 man-hours per square mile. Because of the extremely rugged nature of the terrain and extreme brushiness of the project, strictly standard map accuracy was not obtained on the job. A total of seven profiles were run by the State of Washington on this project. Results of these profiles are:

Cinebar to Brenner Topography Accuracy Results*

Mean error	-2.42 feet
Maximum error	-9.00 feet
90.7% within	±5 feet
71.8%	±2.5 feet

*Based on a total of 226 measured points on seven independent profiles.

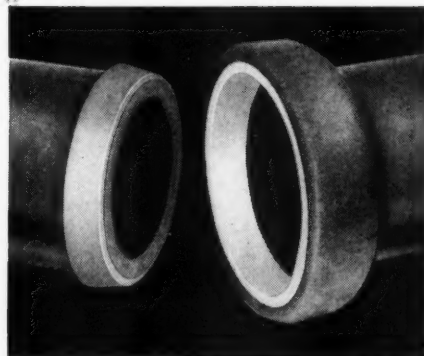
The interesting thing to note in regard to these profiles is that there is very little difference in accuracy between the relatively open semibushy areas

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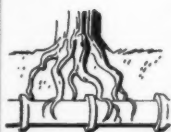
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force the pipe out of line and clog the system in search of moisture. Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in constant compression. Roots cannot enter the line.

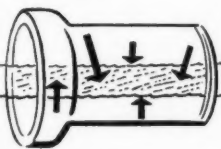
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is the wearing out of pipe by abrasive action of sand and gravel. Soft pipes become scratched and roughened and tend to clog up. Because Amvit is a really tight joint, no foreign matter can possibly enter the line.

5. DECOMPOSITION

is the chemical breakdown of the component elements of the pipe. Only clay pipe resists decomposition. Like the pipe, the joint is unaffected by ordinary conditions of underground service.

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and the timbered areas which were done primarily with crude field methods. It is felt that under conditions such as these, results much better than this are almost impossible to obtain. It is also difficult, even in field work, to ascertain in some places exactly where the ground is. Those who are familiar with west coast conditions realize that in walking on the ground one is often walking from two to five feet above the ground on old windfalls and brush piles. A precise delineation of the mineral soil profile prior to a clearing operation often is impossible.

Conclusions and Recommendations

It can be said that the primary objective of this survey — to obtain close liaison between stereocompilation and field completion — was obtained. All sorts of combinations of field and office work were possible. The use of two-way radio between the office and the field was not used as much as originally anticipated. Since the compilation office was within a mile or two of the field operation and since the field crews checked in at noon for lunch at the compilation office, close liaison was possible without the use of the radio. It also was found that a two-way radio was simply excess baggage in some of the brushy areas. In other instances it was very desirable for the crew safety.

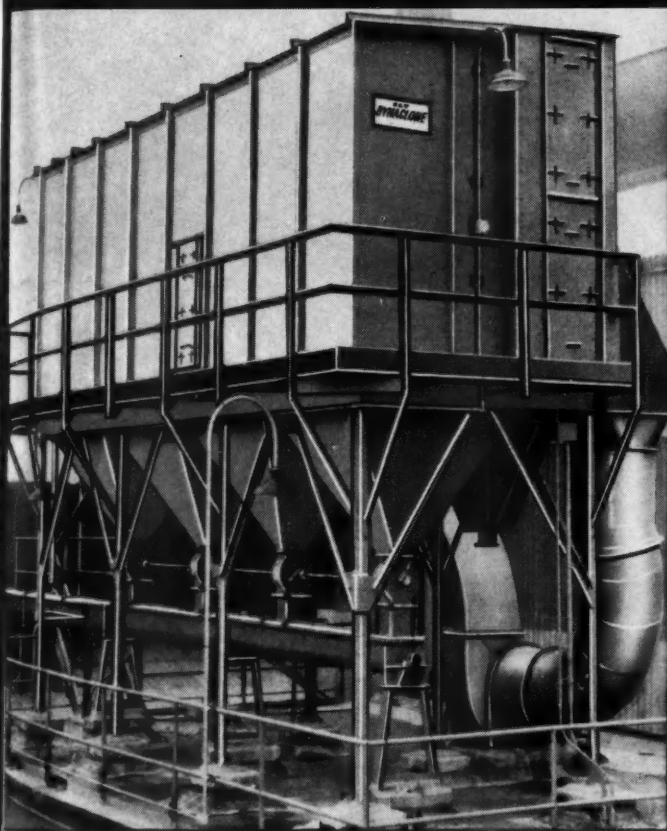
Perhaps the most important lesson learned in the course of this job was the need for the training of specialty men, both in compilation and in field work for this type of terrain. Those who are not familiar with northwest terrain and brush conditions cannot always understand this problem. Some engineers, with the proper training, can get along well with caulk shoes and can conduct reasonably accurate engineering field operations. Others simply are not suited to undertake this type of work. Bear in mind that there are many places on this type of ground where the slopes are in excess of 75 percent, and the brush cover is such that a man cannot see more than 10 feet in any direction.

It is necessary also for the field crews to get over all of the ground in these areas for there are many hidden draws, springs, benches, and cliffs, which cannot be discerned from aerial photography, yet for design work they are critical.

Competitive Bidding Impractical

One of the most discouraging features of this undertaking was the realization on the part of the engineers conducting this survey, of the utter ridiculousness of attempting to get competitive bids from photogrammetry companies for surveys of this class. The peculiar combination of skills necessary to undertake this work requires a specialty engineering organization working primarily to meet the objectives of the survey. We feel that this type of work should be negotiated as is design work, not competitively bid, as some states currently demand. ▲▲

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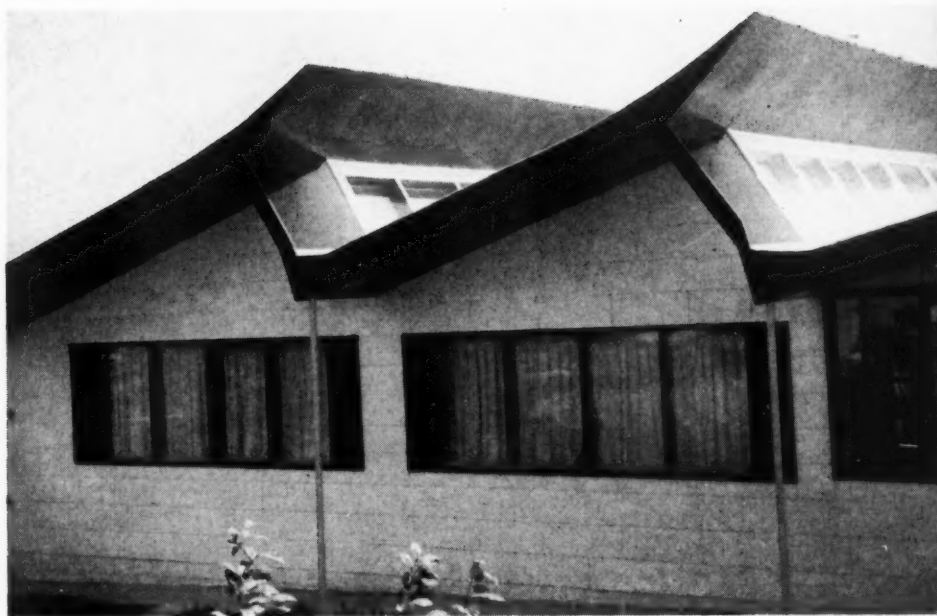
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IT IS POSSIBLE to design a building so that it becomes its own solar heat collector. This direct solar heating system then can be combined with any kind of conventional heating system to supply the full amount of heat required for comfort conditions. Fuel savings will depend on geographical location and design details. An experimental building with 2250 square feet of floor area built in Denver, Colorado, showed a fuel saving of 35 percent and the possibility of increasing this to 50 percent through the use of automatic controls.

Cp exclusive

Saw-Tooth Roof Design

A building designed for direct solar heating is essentially a conventional structure with a modified saw-tooth roof, the glass facing south instead of north as in the usual method of construction. The clerestory windows are set at an angle, this angle depending upon the latitude of the site and the months of the year with the greatest number of degree days. When the angle of the windows is properly selected, the sun's rays will approach an angle perpendicular to the glass during the cold months. This reduces the loss of heat caused by angular reflection of the sun's rays at the time when the heat demand is greatest.

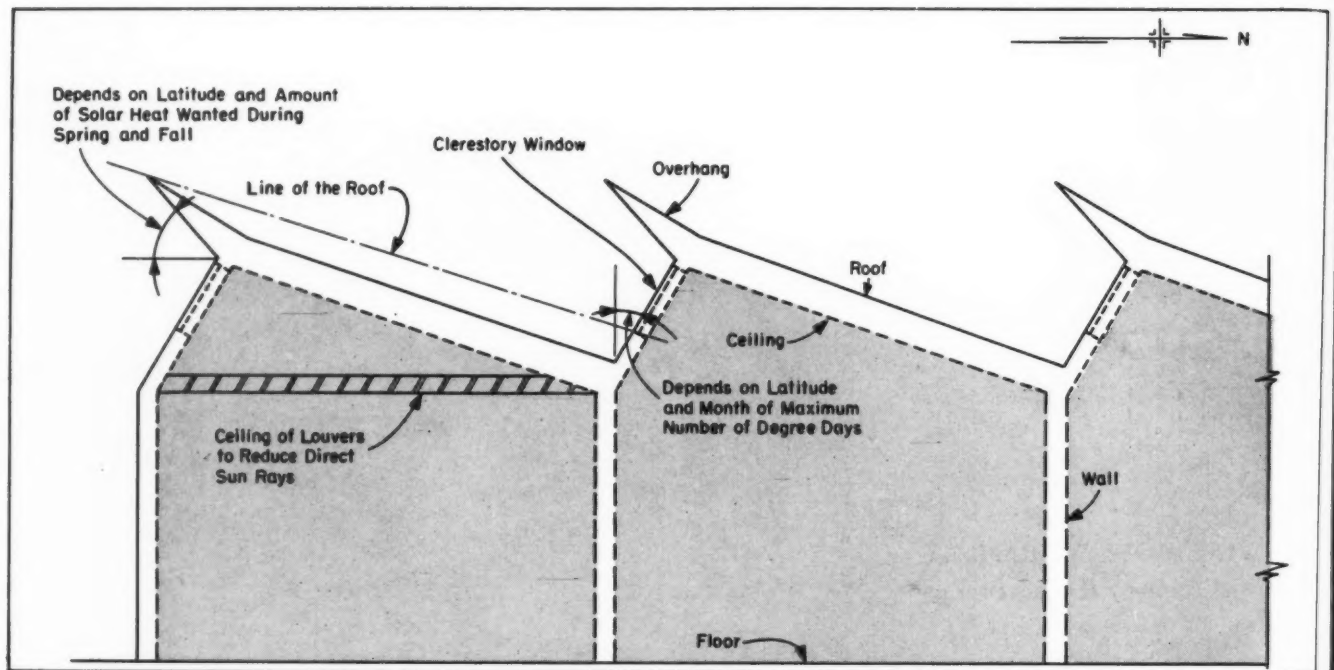
The clerestory windows must be provided with an overhang. This protects the windows against

weather, especially hail, and also controls the amount of solar heat so that the maximum enters during the winter and the minimum during the summer. The latitude at which the project is located is the controlling factor in the selection of the angle of the overhang. Sun coming through the windows will produce the maximum heat gain until the angle of the sun equals the angle of the overhang. A properly designed overhang will shade the windows in the summer but not in the winter.

If the building makes use of more than one bay, the roof of the southernmost bay should not shade the windows of the next bay to the north. The line of the roof from the tip of the overhang to the bottom of the glass should be at less than a 90 degree angle with reference to the plane of the clerestory windows.

Controlling the Heat

A number of arrangements might be found to control the amount of solar heat entering the building. An inexpensive design used on the experimental building consists of shadowproof window shades guided by slots in the sides of the windows leading into a slot at the top. These shades are standard window shades with the catch removed from the roller end. This allows them to be raised or lowered to any position by the use of a cord that passes through a conventional venetian blind catch. Four or five



ELEVATION DRAWING SHOWS HOW SAW-TOOTH DESIGN CONTROLS HEAT ADMITTED ACCORDING TO SEASON.

shades can be operated from one cord. These blinds can be made to operate automatically by the use of a reversing motor, a thermostat, and limiting switches.

Instead of using shades, the solar heat gain can be controlled by outdoor louvers. These louvers can be operated by a cable connected to a gear motor actuated by a solar control as well as an indoor thermostat. Limiting switches would stop the motor when the louvers are at full open or full closed position. This design has some advantage over the

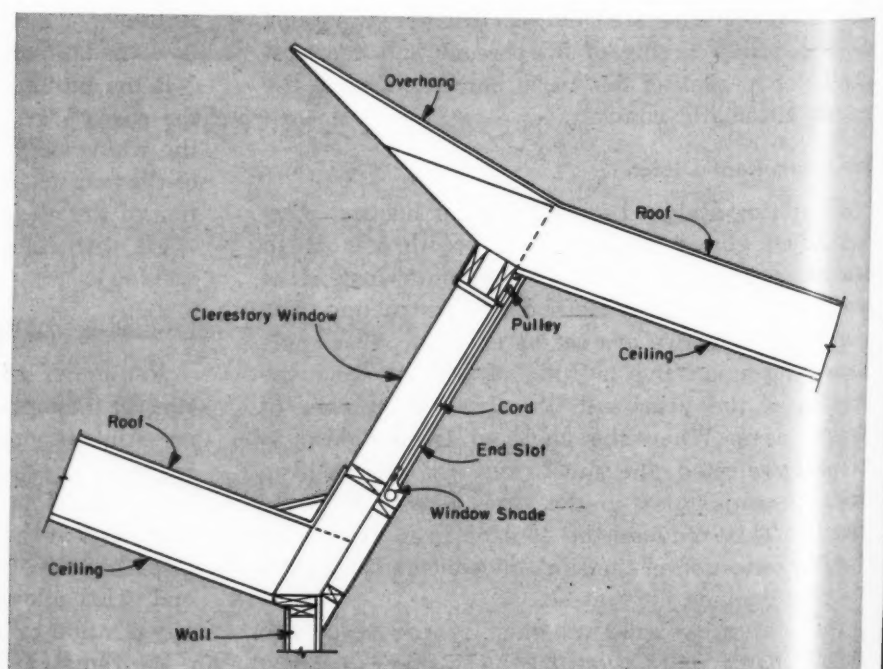
shades in that it excludes the sun's rays from outside of the building. Inside shades permit the entrance of some heat even when fully closed. Nevertheless, the window shade method of control works very satisfactorily.

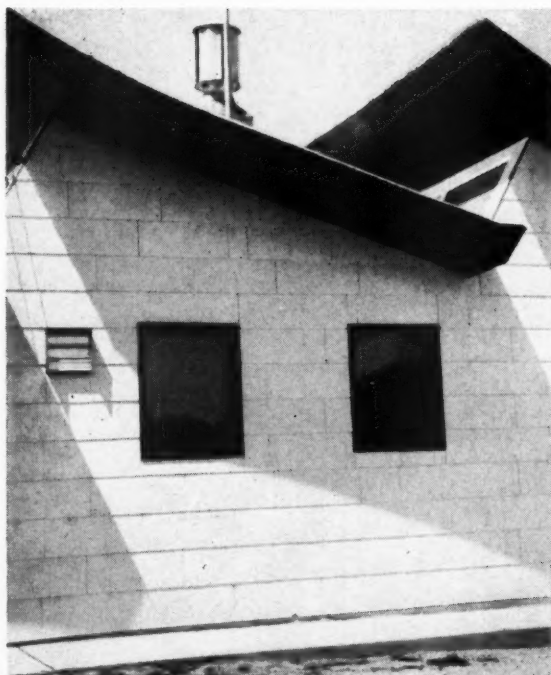
Design Details

With this structural design all areas of the building receive equal amounts of solar heat. This simplifies the design of the auxiliary heating system.

If the direct rays from the sun are objectionable

DETAIL ILLUSTRATES ARRANGEMENT OF PULLEY AND SHADES TO CONTROL HEAT THROUGH WINDOW.





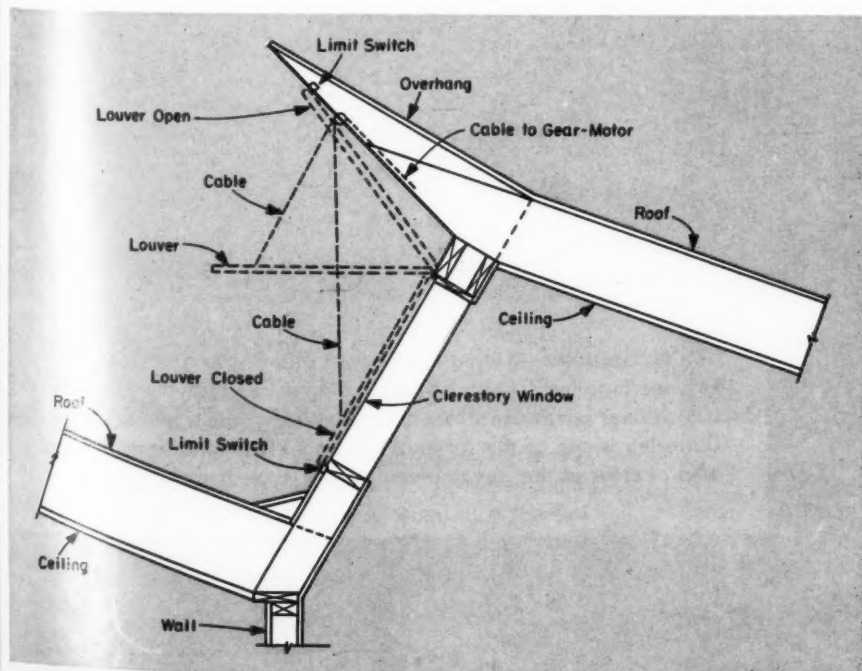
THIS AND PHOTOGRAPH ON PAGE 127 SHOW CONSTRUCTION OF THE OFFICE IN DENVER.



PHOTOGRAPH FROM INSIDE OFFICE SHOWS PARTLY DRAWN SHADES OVER CLERESTORY WINDOWS.

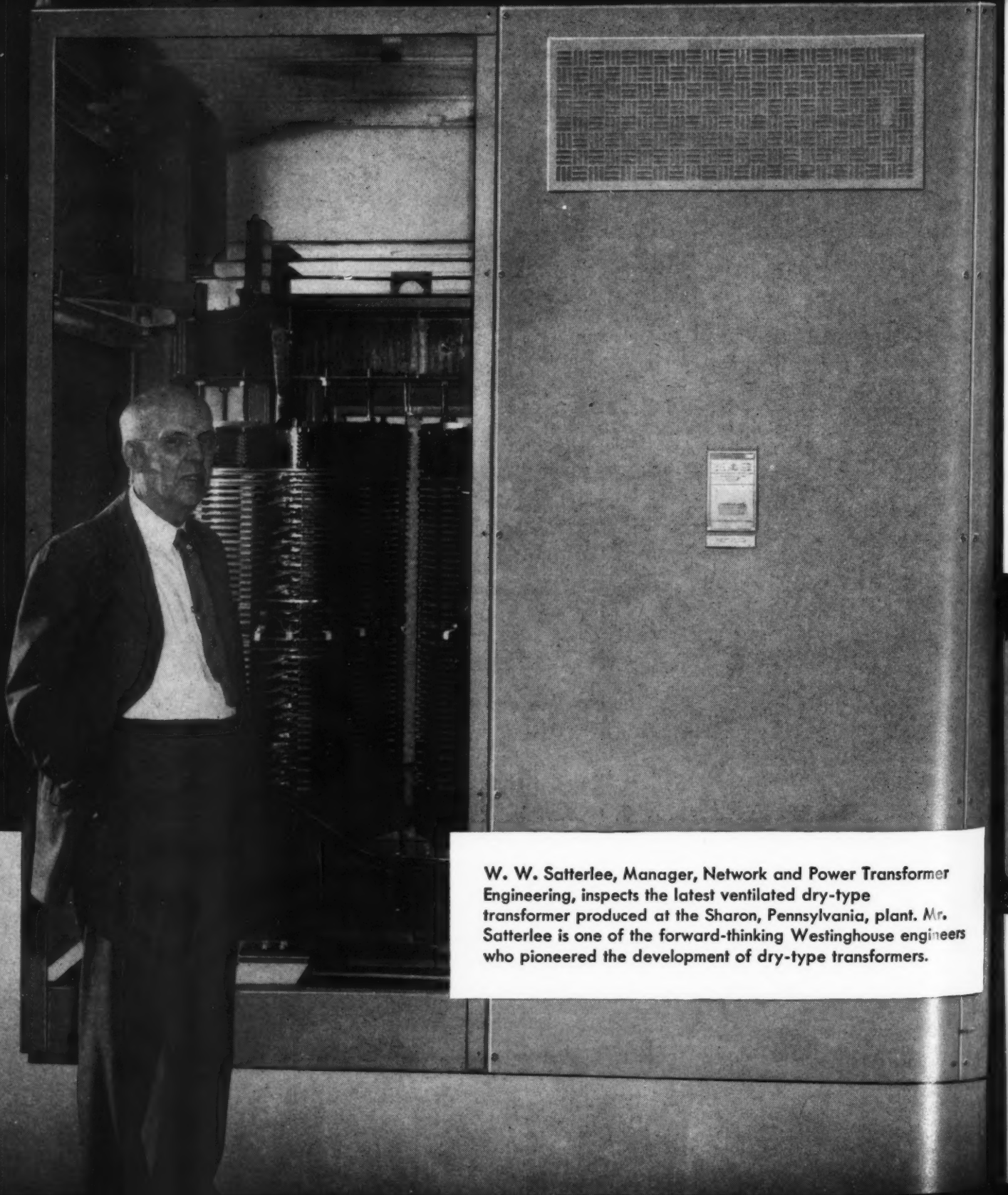
within the building, a ceiling of louvers can be built at the elevation of the base of the clerestory windows. This prevents the direct rays of the sun from entering the space below.

This type of roof costs more to construct than a conventional roof, but this is somewhat offset by the reduced roof area resulting from the tilt of the clerestory windows. There is also the cost of the glass, the overhang, and the control arrangement. Against this must be balanced the fuel savings made possible by the use of free solar heat. ▲▲



INSTEAD OF SHADES, A THERMODYNAMICALLY CONTROLLED LOUVER CAN COVER CLERESTORY WINDOWS.

First for 20 years...



W. W. Satterlee, Manager, Network and Power Transformer Engineering, inspects the latest ventilated dry-type transformer produced at the Sharon, Pennsylvania, plant. Mr. Satterlee is one of the forward-thinking Westinghouse engineers who pioneered the development of dry-type transformers.

Safe, flexible Westinghouse dry-type transformers put your power where it's needed— at the center of the load

Twenty years ago, the first ventilated dry-type transformer was put into service. It was developed and built by Westinghouse. Since that time, Westinghouse has produced ventilated dry-type transformers with a total capacity of 5¼ million kva.

Fifteen years ago, the first sealed dry-type transformer was installed. This, too, was a Westinghouse development. Now, over 325 thousand kva of Westinghouse sealed dry-type transformers are in service.

This is the experience that stands behind every Westinghouse dry-type transformer—experience that has contributed to such factors as:

Safety—Westinghouse dry-type transformers need no vaults. There are no insulating liquids; no danger of either primary or secondary explosions.

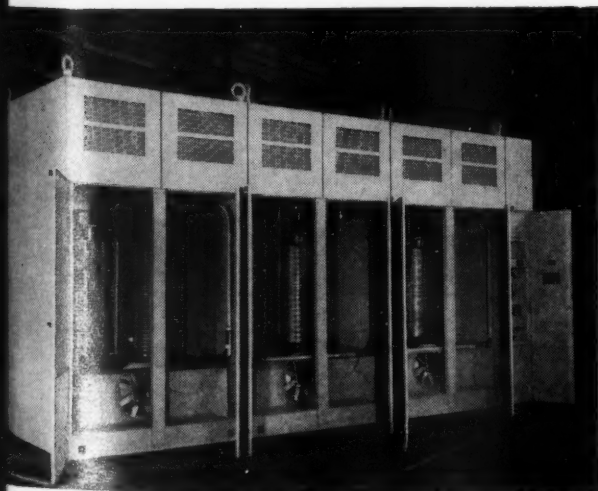
Reduced installation costs—Requiring no special fire and explosion protection, Westinghouse dry-type transformers can be balcony-mounted. This not only reduces the original costs, but frees valuable floor space for other uses.

Reduced maintenance costs—Westinghouse dry-type transformers require little maintenance; no liquid to filter or replace.

Flexibility—Westinghouse dry-type transformers are flexible, can be located near the center of the load, with shortened secondary leads.

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POWER-UP! Lengthy and overloaded secondary leads rob your equipment of power, steal its efficiency. If motors, lights and other equipment perform sluggishly or unevenly, it's a sign of voltage drop . . . And it's time to POWER-UP! Westinghouse dry-type transformers will shorten those secondaries, put your power where it's needed—at the center of the load. Ask your Westinghouse representative or your utility power sales engineer for specific recommendations to fit your problem.



This 7,500/10,000-kva ventilated dry-type unit substation transformer is the largest ever built. This unit utilizes Class B insulation, reducing fire hazards and eliminating danger of explosions.



This 3,000-kva sealed dry-type unit substation transformer, with high-voltage terminal chamber and provision for connection to low-voltage switchgear, is the largest ever manufactured.

YOU CAN BE SURE...IF IT'S **Westinghouse**

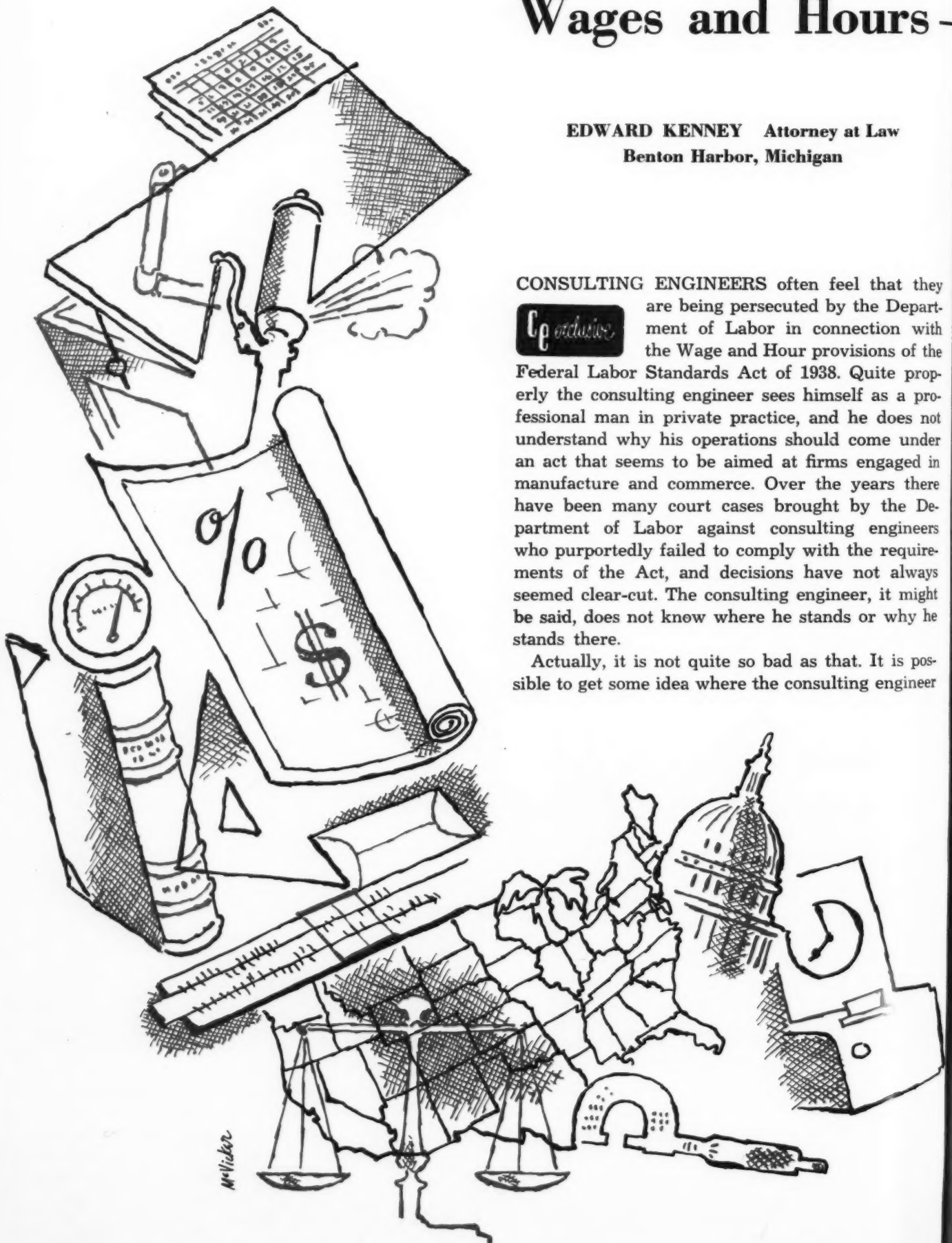


Wages and Hours —

EDWARD KENNEY Attorney at Law
Benton Harbor, Michigan

CONSULTING ENGINEERS often feel that they are being persecuted by the Department of Labor in connection with the Wage and Hour provisions of the Federal Labor Standards Act of 1938. Quite properly the consulting engineer sees himself as a professional man in private practice, and he does not understand why his operations should come under an act that seems to be aimed at firms engaged in manufacture and commerce. Over the years there have been many court cases brought by the Department of Labor against consulting engineers who purportedly failed to comply with the requirements of the Act, and decisions have not always seemed clear-cut. The consulting engineer, it might be said, does not know where he stands or why he stands there.

Actually, it is not quite so bad as that. It is possible to get some idea where the consulting engineer



Consulting Engr. vs. Secy. of Labor

stands even if we can but speculate as to why he is in that position. The Act states clearly that it is the avowed purpose of the Congress to eliminate certain labor conditions in interstate commerce.¹ Certain minimum wage and maximum hour requirements are imposed for employees engaged in commerce or in the production of goods for commerce.² Employers subject to the Act must keep appropriate records and make reports to the statute's Administrator in the Department of Labor in a manner prescribed by the Administrator.³ The word "commerce" is restricted to that which is interstate.⁴ Engagement in the production of goods for commerce includes work in any closely related process or occupation directly essential to production.⁵

Test of Coverage

It must be remembered that the test of coverage is the character of the employee's activity and not the nature of the employer's business.⁶ However, the nature of the employer's business may be indicative of employee activity,⁷ and practical considerations are paramount in classifying employee activity.⁸ Thus, even the slightest submersion in the interstate stream may involve the employer, but not necessarily the employee, if this submersion is regular and constant.⁹

Yet, too much reliance may not be placed in this analysis. Conflict in opinion has been acute in crucial cases, and the jurisprudence implementing the statute is still formative and fluctuating.

The Client's Activities

It is evident that the consulting engineer offers a professional service. It is also clear that this service may involve employee activity exerting a causal effect on interstate commerce. Generally speaking services performed for a producer (manufacturer) in interstate commerce are covered.¹⁰ Likewise, services performed for an instrumentality of interstate commerce (a railroad or highway authority) entail coverage.¹¹ Thus, we observe that a service organization may be brought under the act by the nature of the activities of the client.

We also are confronted with the intimate association of the consulting engineer with the construction industry. The prevailing theory seems to regard the building contractor erecting an entirely new project as a consumer of the materials involved in the new structure. Under this theory the con-

tractor's activity on original construction is excluded from coverage as intrastate in character.¹² On the other hand, renovation construction (repairs, improvements, or additions) for someone engaged in interstate commerce has been found to participate in that interstate activity.¹³

Under this interpretation of the law, consulting engineering service performed upon original construction would be local and intrastate,¹⁴ and this has been held in judicial decisions. A consulting engineering firm entered into a contract with an aircraft engine manufacturer and the Defense Plant Corporation for the design and construction of a manufacturing plant. As the project developed, certain changes in design and construction were required which necessitated the issuance of new work orders to the subcontractors. An employee of the engineering firm spent 23 months in preparing and issuing these new work orders. In a suit by the employee to recover overtime compensation under the Federal Fair Labor Standards Act, judgment was given in favor of the engineering firm. The court said:¹⁵

"Plainly the erection of the factory for the Defense Corporation was new construction and as such not within the coverage of the . . . Act."

Improvement Work

On the other hand, engineering service in connection with work for interstate instrumentalities is another matter.¹⁶ The Secretary of Labor filed suit to enjoin an engineering firm from violation of the Fair Labor Standards Act. The firm was engaged in conventional engineering activity, service upon any construction project being governed by a contract. Prior to construction, the engineering firm would make initial surveys, prepare plans and designs, prepare cost estimates and contractual forms for bidders and the building contractor, and advise on the acceptance of bids. After construction was awarded to a building contractor, the firm would furnish inspection service by a resident engineer during the period of construction. He would inspect all materials and construction work and would make periodic estimates of progress and of the money which was earned by the building contractor. The plans drafted by the firm sometimes would be sent to bidders outside the state, and sometimes would specify products of firms located outside the state. Between 1950 and 1953, the firm

participated in engineering work for the following projects, all within the State of Iowa:

- ¶ The paving of streets in four Iowa towns.
- ¶ The enlargement of a power plant, and the improvement of equipment of an interurban railroad.
- ¶ The improvement of the equipment at a municipal power plant of the City of Pella, Iowa.
- ¶ The construction of headquarters for three rural electrification projects.

In reversing a previous dismissal of this suit, the court declared:¹⁷

"In this case the activity of defendant's employees was in connection with the repair, alteration, and improvement of existing instrumentalities of interstate commerce. Their duties, beyond the preparation of plans and specifications for a proposed construction project, required their presence at the job site as 'resident engineer.' Although the 'resident engineer' did not remain at the project at all times, the stipulation shows it was his duty to inspect all incoming materials to determine if they measured up to specifications; to inspect work completed by the contractor to ascertain if it conformed to the plans and specifications; and to make progress reports to the owner and recommend payment of moneys earned under the contract if the contractor's work was satisfactory. The inference is fairly deducible that the work of the 'resident engineer' was a vital factor effecting the progress of the construction project. Further, although the stipulation recites that the 'resident engineer' has no right or duty to direct or control the contractor in his work, the fact remains that completion of a project depends in no small way upon the services rendered by defendant's employees."

In this decision the court is emphasizing the fact that much of this work was improvement work in connection with existing facilities connected with interstate commerce. The court further emphasizes the "vital" nature of the resident engineer's work.

Separate Operations

Sometimes intrastate and interstate operations are so disconnected, separate, and distinct that they may be considered to be segregated, and coverage is confined exclusively to interstate parts of the business. However, it must be noted that employee activity for a substantial period of time, on interstate operations, even if this activity can be segregated, involves the employer.¹⁸ In the absence of proof of this substantial expenditure of time upon such segregated activity, coverage was denied by a court to certain central office employees.¹⁹ The reasoning of the court is interesting:²⁰

"Inasmuch as the only employees in this group serviced by the central office who are engaged in interstate commerce are the seal-checking guards, of whom there are only three, and two watchmen in the Lexington bakery, which is engaged in produc-

tion, and since the record is silent as to the amount of time actually expended by the employees in the central office in connection with these five employees, the plaintiff has not established that in connection therewith central office employees are devoting a substantial part of their time to these five employees... and hence this court cannot say that the said central office employees are covered by the Act."

Furthermore, an occasional and momentary assignment of a single employee to serve an interstate instrumentality may not expose the employer to interstate liabilities.²¹

Remote Operations

If the services rendered consist of mere oral advice or perhaps involve even a written communication containing little analysis or few specifications or meager evidence of research or study, the consulting service might be considered too remote from the stream of interstate commerce for coverage to apply.²² In one instance, a firm providing janitorial service for an interstate bank was excluded in the following language:²³

"Here... the employees concerned are not in any sense engaged in production nor are their activities integrated with the production of goods."

Service Establishment Exemption

Finally, the consulting engineer, more than one-half of whose practice may consist of service upon original construction or strictly local operations may be exempt by virtue of Section 13 (a) (2) of the Act.²⁴ This exemption reads as follows:²⁵

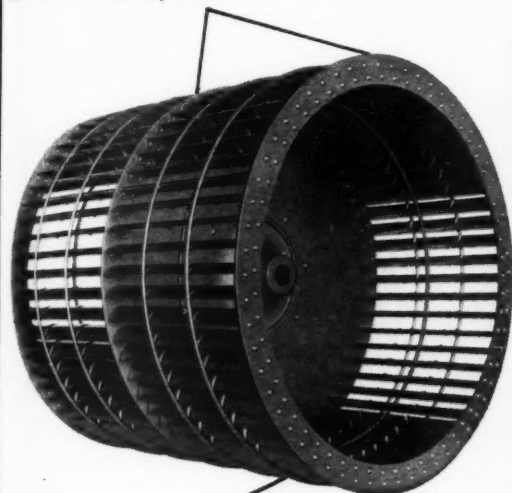
"The provisions of sections 206 and 207 of this title shall not apply with respect to... any employee employed by any retail or service establishment more than 50 percentum of which establishment's annual dollar volume of sales of goods or services is made within the State in which the establishment is located. A 'retail or service establishment' shall mean an establishment 75 percentum of whose annual dollar volume of sales of goods or services (or of both) is not for resale and is recognized as retail sales or services in the particular industry..."

In this connection, it must be recalled that building contractors in original construction are considered to be ultimate retail consumers of the materials translated into the structure.²⁶

An engineering firm may be supervising simultaneously local original construction projects in several states. Yet, interstate communications, and traveling and correspondence between these local jobs and the central office, probably would be regarded only as incidents of intrastate business.²⁷ The following remarks by a Federal Court embrace precisely this situation.²⁸

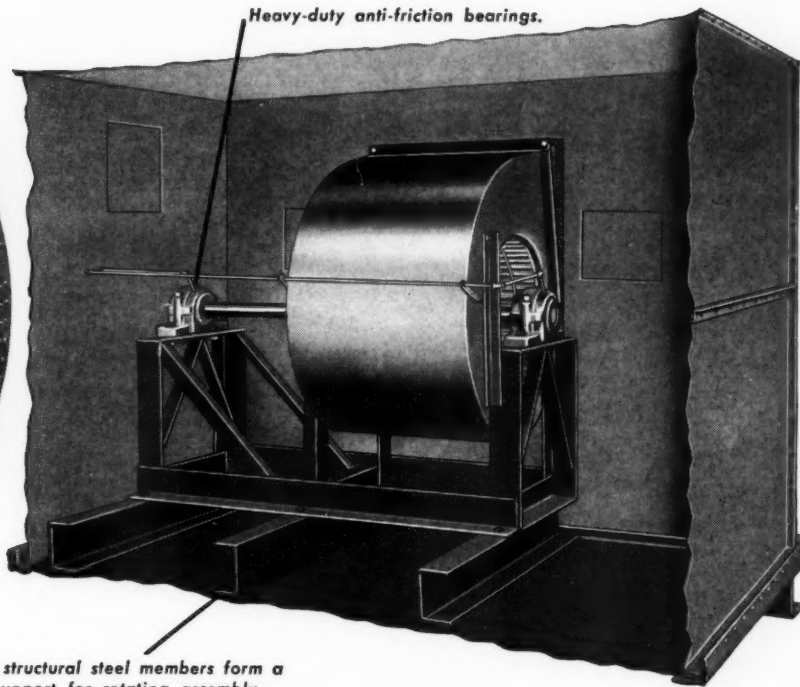
"There is a grave dispute between the parties whether any of the work orders and accompanying

Individual die formed, forward curved blades are securely riveted to rim and centerplate.



Peripheral reinforcing and heavy-duty hub provide added strength and rigidity.

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Heavy structural steel members form a rigid support for rotating assembly.

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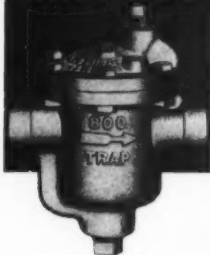
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letters sent out by Kelly crossed state lines. But even assuming that they did, we are satisfied from our independent examination of the evidence that the District Judge was entitled to find as he did that these were an 'incident of intrastate business.'

Unsettled Status

In summary, this study may warrant the following conclusions:

¶ The consulting engineer firm whose services are addressed mainly to original construction may be completely exempt from the Act.

¶ The consulting engineer firm that undertakes engineering services in connection with renovating projects upon interstate instrumentalities, this type of work comprising more than 50 percent of the business, probably would find itself involved.

¶ It would seem that isolated and remote interstate activity would not expose the firm to coverage.

It is important to note that all of the foregoing comment deals with whether or not the employer (the firm) is involved under the Act. Specific employees may be exempt for a number of reasons even though the firm is covered. As has been pointed out, the real test of coverage is the character of the employee's activity and not the nature of the employer's business. This is important to the consulting engineer in that all executive, administrative, and professional employees are exempt from the provisions of the Act whether or not the firm is engaged in interstate commerce.

There are, of course, borderline cases, and it sometimes is hard to tell whether an employee falls into a professional or subprofessional category. There seems to be a trend toward acceptance of any registered engineer as a professional employee without further question, but if the employee is engaged in engineering work but is not registered, his professional, executive, or administrative position will have to be established in other ways before he can be exempt from coverage.

On the other hand, if the firm can show that it is not engaged in interstate commerce as defined in the Act, then the Wage and Hour provisions do not apply to any employees, regardless of their position in the firm.

Clearly, the status of the consulting engineer under this law is not fully settled. This is perhaps difficult for the consulting engineer to understand, for he looks at others offering professional services—doctors, lawyers, and even architects—and he notes the Wage and Hour investigators of the Department of Labor seem to pay little attention to these professional service firms, assuming, it would seem, that they are automatically exempt from the Act. The engineer wonders why he is different. This difference may lie partly in the courts' relative lack of familiarity with the private practice of engineering. Even more likely it comes from the courts' ap-

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R-1554R

NOVEMBER 1957

137

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CONSULTING ENGINEER, 227 Wayne St., St. Joseph, Mich.

Name

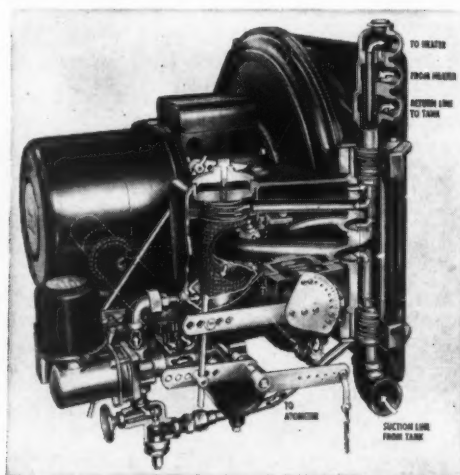
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preciation of the fact that there is a more intimate and vital connection between the work of the consulting engineer and the work of his client than there is between the work of the doctor or lawyer and the work of his client. For example, design and supervision of construction of an addition to a power plant seems to be more intimately connected with the distribution of interstate power than does the work of the doctor who sets a broken leg for a workman on the project, or the work of a lawyer who is engaged in a legal action for the power company. This justification cannot be used when comparing the architect and the engineer. Here we can only surmise that the esthetic nature of architecture as opposed to the functional nature of engineering might influence the interpretation of the court as to which is more related to commerce.

If the situation seems unfair to the engineer, he can remember that it is not yet finally settled. There are new cases every year, and the more cases brought before the court, the clearer the status of the consulting engineer will become. ▲▲

Annotations

1. Section 202(b).
2. Sections 206 and 207.
3. Section 211(a).
4. Section 203(b).
5. Section 203(j).
6. Walling v. Jacksonville Paper: 317 U.S. 564, 87 L.E.D. 460, 468; Overstreet v. North Shore: 318 U.S. 125, 87 L.E.D. 656, 663.
7. Walling v. Jacksonville Paper: 317 U.S. 564, 87 L.E.D. 460.
8. Overstreet v. North Shore: 318 U.S. 125, 87 L.E.D. 656, 660; Mitchell v. Vollmur: 349 U.S. 427, 99 L.E.D. 1196, 1200.
9. Mabey v. White Plains: 327 U.S. 178, 90 L.E.D. 607.
10. Martino v. Michigan Window Cleaning Company: 327 U.S. 173, 90 L.E.D. 603; Roland Electric v. Walling: 326 U.S. 657, 90 L.E.D. 383; Warren-Bradshaw v. Hall: 317 U.S. 88, 87 L.E.D. 83; Walling v. Sondock: 132 Federal (2) 77; Phillips v. All Service Laundry: 149 Federal (2) 416.
11. Boutell v. Walling: 327 U.S. 463, 90 L.E.D. 786.
12. Van Klaveren v. Killian-House: 210 Federal (2) 510, 43 A.L.R. (2) 885; Barbe v. Cummins: 138 Federal (2) 667; Moss v. Gillioz: 206 Federal (2) 819; Crabb v. Welden: 164 Federal (2) 797.
13. Mitchell v. Vollmur: 349 U.S. 427, 99 L.E.D. 1196.
14. Kelly v. Ford, Bacon and Davis: 162 Federal (2) 555.
15. IBID: page 557.
16. Mitchell v. Brown: 224 Federal (2) 359.
17. IBID: page 364.
18. Walling v. Jacksonville Paper: 317 U.S. 564, 87 L.E.D. 460; Hertz Drivurself Stations v. United States: 150 Federal (2) 923, 926, 927, 928.
19. Mitchell v. Joyce Agency: 211 Federal (2) 241.
20. IBID: page 248.
21. Farr v. Smith: 38 Federal Supplement 105.
22. Rosenberg v. Semaria: 137 Federal (2) 742; Bartholome v. Baltimore Fire Patrol: 48 Federal Supplement 98.
23. Rosenberg v. Semaria: 137 Federal (2) 742 at page 744.
24. Sesser v. Sertner's Inc.: 166 Federal (2) 471.
25. 29 U.S.C.A. Section 213(a) (2).
26. Van Klaveren v. Killian-House: 210 Federal (2) 510, 43 A.L.R. (2) 885; Barbe v. Cummins: 138 Federal (2) 667; Moss v. Gillioz: 206 Federal (2) 819; Crabb v. Welden: 164 Federal (2) 797.
27. Kelly v. Ford, Bacon and Davis: 162 Federal (2) 555.
28. IBID: page 559.

FERNAND ERNSTEIN

Comments From France



I THINK OF MYSELF as a disciple of Descartes, and to a Cartesian, a word or phrase has no meaning unless it can be defined. Unfortunately, I have always found it difficult to define "consulting engineer." It is a phrase that seems to cover so many and such varied activities.

This past summer my wife and I visited the old churches of Brittany. While engaged in this peaceful pursuit, I contemplated my 35 years as an engineer in private practice. I attempted to find some reasonable definition for "consulting engineer"—some expression that would convey the essence of private professional practice. I fear that I failed to find a precise definition, but I did establish for myself a concept of the consulting engineer, his characteristics, and his responsibilities.

Competence Comes First

First, I decided, the consulting engineer must be competent. As a specialist in some branch of applied science, his competence in that field must be unquestioned. But he is much more than an expert. His competence presupposes a general culture, a background that is broad and learned. Superimposed on this there must be a solid base of scientific knowledge. Finally, he becomes a specialist as the result of his heritage, his environment, and his formal education, but his knowledge of his specialized field is a personal creation. It comes only from experience and creative thinking. It comes from within; it cannot be part of a formal education unless we would have all engineers cast from one mold, all conforming to a pattern established by formula. This would defeat the whole concept of engineering. It would reverse our goal.

In emphasizing the importance of creative thinking, I do not degrade the role of the universities and engineering schools. Quite the contrary. Creative work seldom can be accomplished except it be based upon solid academic knowledge. And this great body of knowledge is constantly expanding. The engineer some few years out of school will find, if he looks back to his formal courses, much that has changed, more that has expanded. The wise engineer cannot stand on his old rock of solid empiricism and let the tide of new knowledge drown him. He must rise with it, and the way to do that is to collaborate with the universities. That is, the consulting engineer should teach. This can be of advantage to both the engineer and the school. Teaching enables the consulting engineer to follow the rapid and continual evolution of science. It keeps the schools from becoming mired in the bog of scholasticism, losing contact with material reality.

A Limited Field

It seems to me, also, that technical competence must be based upon a limited field of practice. The consulting engineer must avoid any resemblance to the one-man-band, the circus performer who plays all instruments at once but cannot play any of them with real proficiency. On the other hand, limiting one's self to a small field of applied science does not imply a withdrawal into a monastic cell to which those who want your wisdom must journey. Anonymity is to be avoided. The consulting engineer should be conscientious, ready to accept all professional responsibilities and to openly defend his opinions. Specialization need not suggest seclusion.

It is clear that the consulting engineer must be an explorer—a pioneer. This implies not only or-

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iginal thought but independence of thought. This independence is the consulting engineer's greatest asset. Engineers employed by the construction companies and manufacturing firms can be as technically astute as any private practitioner. Let us admit that they may be our technical superiors, but because of their affiliation with a commercial organization, they are dependent. I respect them, but their professional environment is different. In our projects our sole endeavor must be in the interest of our clients, and our activities must be without relations to commercial considerations. In this regard, the consulting engineer must be like Caesar's wife, above suspicion.

Commercial Eggheads

The engineer in private practice does not scorn commercial enterprise. He is himself a businessman. From my own personal observation of my colleagues, I find that the consulting engineer may be a hard-headed business man or he may be an intellectual, an egghead. These represent the two extremes, the ultraviolet and the infrared. I believe that most of my French colleagues fall in the middle of this professional spectrum. Perhaps they take more pride in the purely intellectual than the average American consultant, for it would seem that there is more respect for the egghead in Europe than in America. But I suggest, completely without malice, that any society that scorns the intellectual runs the risk of lapsing into sterility. Perhaps it is this difference in attitude that accounts for Europe's leadership in basic scientific discovery and America's leadership in the application of these discoveries to commercial ends.

One might say that these reflections in a provincial churchyard idealize the consulting engineer. Such an engineer may not exist. I may be considering the essence, the form, but not the reality. If this be true, it is still

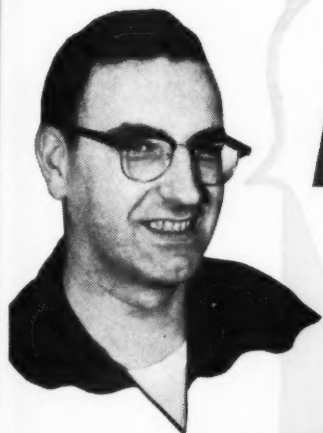
our duty to strive toward the attainment of that ideal. To aid us toward our goal we have the several national organizations of consulting engineers. The constitutions and bylaws of these organizations and the International Federation (FIDIC) all describe the ideal for which we reach. These statutes emphasize the independence of the consultant. The principles of FIDIC insist that the consulting engineer:

- ¶ must retain absolute independence of action with regard to contractors, and he must never accept from them any kind of favor which might compromise the impartiality of his decision or prejudice his duties to his client;
- ¶ must not be connected with any trade or commercial business;
- ¶ must be remunerated solely by fees paid to him by his client.

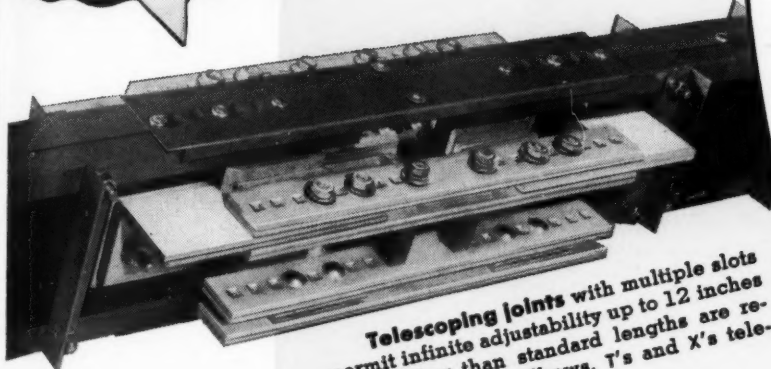
Rediscovering Europe

These are fundamental, and I feel sure that private practitioners in the United States agree with them. In fact, I suspect that the consulting engineers of America are rediscovering Europe, and if I am right, all of us have much to gain. CONSULTING ENGINEER is to be congratulated for its coverage of European professional activity and for its promotion of visits of American engineers to this continent. We also are gaining from the development of a correspondence between members of our group and such American engineers as Mr. Carleton Proctor of the American Institute of Consulting Engineers; President Wolff of the Consulting Engineers Council; Mr. Frank Steiner; and Mr. William Moore. All of these men and many others are interested in setting high standards approaching those of the "ideal engineer."

Our Associations of consulting engineers must discipline their members and guarantee high standards. Then it is to be expected that society will respect the consulting engineer and pay him honestly for his work. ▲▲



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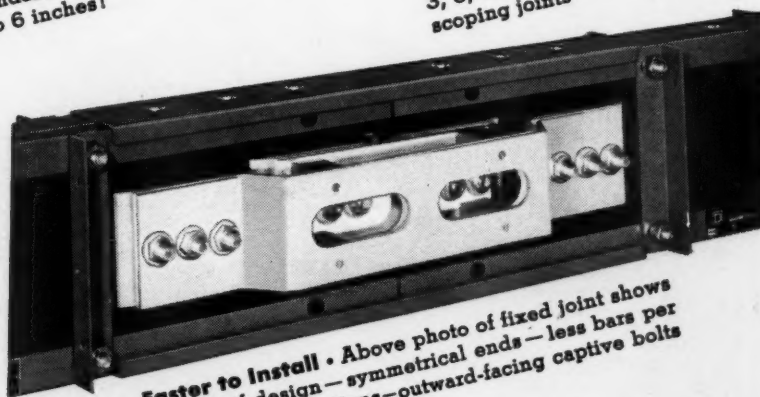
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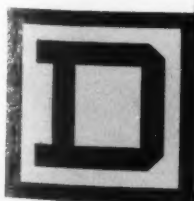
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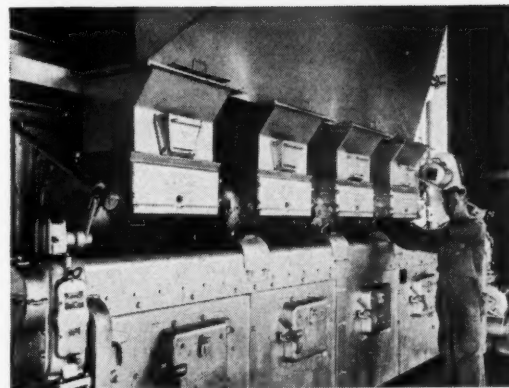
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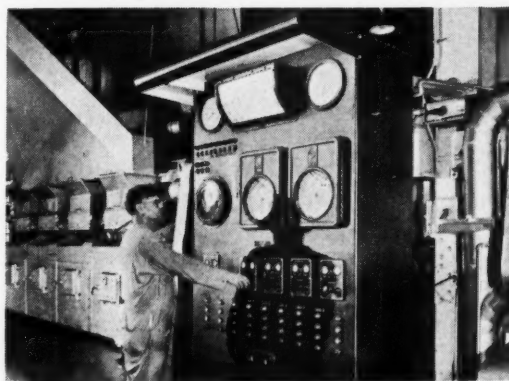
Note cleanliness of firing aisle of GE's power plant. Steam generating equipment consists of five 150,000 lbs./hr. boilers—three by Henry Vogt Machine Co. and two by Riley Stoker Corp.



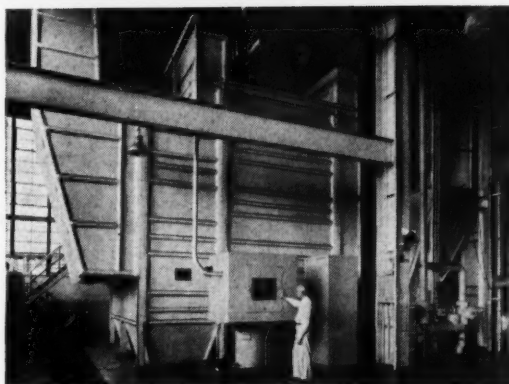
Close-up of Detroit Rotograte Spreader Stoker on a Henry Vogt boiler. Riley boilers are fired by Riley Spreader Stokers. These stokers operate automatically, with continuous ash discharge. All boilers are equipped with non-segregating chutes.



Control panel for Boiler #5. These are Bailey Meter controls, air-operated, automatically handling coal feed, induced and forced draft, overfire air and feedwater regulation.



Prat-Daniel Electrostatic Precipitator and controls; at right, mechanical precipitator by American Air Filter Co. These are connected in series for automatic, efficient fly ash collection and disposal.





Report From The East Coast

STAFF

Dr. William F. Ryan, who is completing his term as ASME president, is planning something unusual for his retirement speech at the ASME annual meeting next month.

"I'm not going to complain about how hard I've worked, how thankless the job, how sad the state of the engineering profession, or the number of rubber chickens I've eaten while holding office. Being president of a national engineering society is nice work if you can get it."

Dr. Ryan, senior consulting engineer at Stone & Webster, added a word of advice for those who would aspire to a national society presidency.

"Go to the management of your firm, and tell them you would like to let your name stand as a nominee for office. Explain that you will not be able to do any work for your firm during your term of office. And you will need a moderate increase in salary to support the dignity of your position. Make it clear that you will be glad to accept the hardship your official duties will entail—if only the company will cooperate."

New Headquarters

Ryan thinks one of the major accomplishments of the engineering societies, during his term of office, was the announcement of and progress toward a new engineering headquarters.

"There is no question but that living together and getting to know each other in the pleasant surroundings of a new headquarters building will contribute toward the eventual unity of the engineering societies," Dr. Ryan pointed out.

"Now they also can start discussing a centralized secretarial and clerical service for all the organizations quartered in the new building. This would result in better service and would be materially less expensive. The ASME alone spends more than \$100,000 a year on secretarial and clerical help."

At present, the only cooperative ventures in the engineering headquarters are a centralized switchboard and the library.

Technical Program

Recalling the progress of the ASME during his term of office, Dr. Ryan noted the "healthy development in the field of professional divisional conferences." The ASME, through divisional meetings, has paid more intensive attention to technical programs, and the conferences have had a wider geographical distribution of authors and contributors to discussions than in the past.

"This leaves us more opportunity to discuss common professional objectives at national meetings."

The retiring ASME president also is pleased with the increasing quality of student competitions. "The performance of competing students speaks well for the engineering profession of the future."

The ASME holds 12 institutes, where student papers are submitted to judges. The top papers at each of these institutes meet and compete and then the winner presents his paper at the annual meeting.

What of the Future?

What would Dr. Ryan like to see happen to the engineering profession in the future?

Unity is one of his fondest dreams.

Dr. Ryan has urged for years that engineers, "Stop talking and act."

"I wish the administrative boards of the Founder Societies and NSPE could feel the seething interest in unity among the dues-paying members. I know it is there. I hear it all the time."

Dr. Ryan said that the most constructive step toward unity would be for NSPE to join EJC. This has been suggested in a recent Intersociety Relations report submitted to the NSPE. About three years ago, the prospect of NSPE becoming a par-



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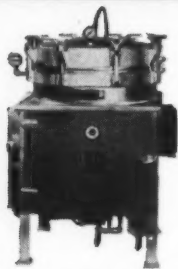


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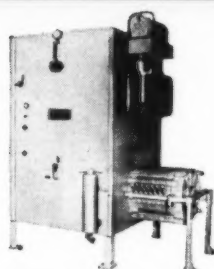
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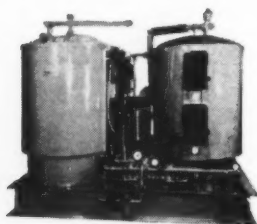
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ticipating body in EJC was discussed by an NSPE committee, of which Dr. Ryan was a member. At the time the suggestion was voted down. "The EJC constitution would make the election of NSPE as a participating body automatic, if NSPE chose to apply," Dr. Ryan said.

Survey Needed

Another necessity for the engineering profession in the future is a comprehensive detailed survey of the profession. In a recent speech, Dr. Ryan said an organization chart of the engineering profession today would "be a good organization for a rabbit warren inhabited exclusively by two-headed rabbits." He added that, by contrast, an organization chart of the medical profession is "so logical and efficient that one would suppose it had been designed by engineers."

At present, EJC and ECPD are investigating ways and means of making a comprehensive survey.

"Nobody knows, even approximately, what the survey will cost or how long it will take. We do not know yet who will make the survey or who will pay for it. All we know is that it is essential to our survival as a profession."

Ethics

What does Dr. Ryan think of the ethics of his profession?

"The ethics are very high. The difficulty is that these ethics are not understood by the politicians, by the general public, or even by the engineers themselves."

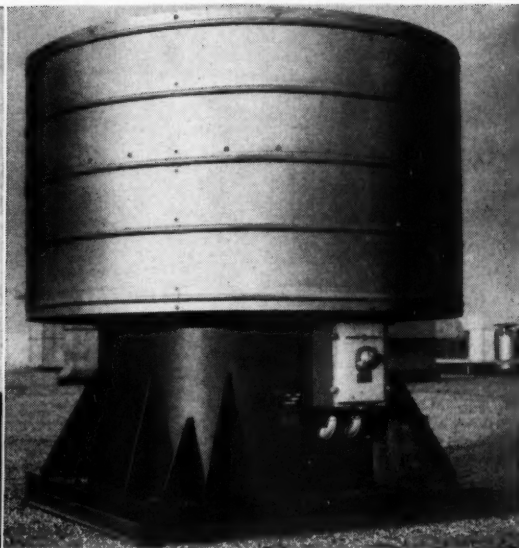
Dr. Ryan said most engineers feel they are doing very well, ethically, if they obey the Ten Commandments and follow the Golden Rule.

"This is very good. But a few things like competitive bidding and the disclosure of a client's confidential information are not covered specifically by the Ten Commandments."

The retiring ASME president said that the engineering schools and the Founder Societies should



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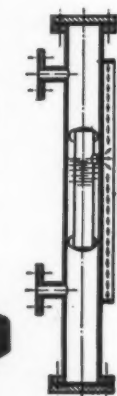
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work together in making young engineers more cognizant of the special ethics of their profession.

Summing up his term of office, Dr. Ryan said, "I've had no outstanding defeats."

Air Pollution

The EJC has issued its first policy statement on air pollution. It is designed as a nontechnical explanation of what air pollution is, and who should be responsible for it. The report is written primarily for distribution to state, municipal, and township governing bodies, chambers of commerce, and other civic groups.

"In view of air pollution's causes and effects, and the technical nature of its control, the engineering profession is qualified and is duty bound to contribute substantially to the control of air pollution," the report states.

"The engineering profession is prepared to discharge its responsibilities in the physical control of air pollution by full participation with other professional disciplines, in establishing and effecting sound policies of control."

The study by the EJC group was begun in April 1956. A policy statement had been suggested a number of times previously, and last year the EJC board decided that the field had become so involved nationally that it was necessary to establish a specific policy. The completed report was adopted unanimously.

Beginning with basic principles, the EJC urges that emphasis be placed on education and voluntary cooperation by all interested parties in air pollution, and pointed out that while laws with appropriate penalties may be necessary, the laws should be used only where cooperation and voluntary action fail.

During an emergency, such as could develop under adverse weather conditions, temporary curtailment of community and industrial activities that contribute to pollution may be necessary. "Although such an emergency



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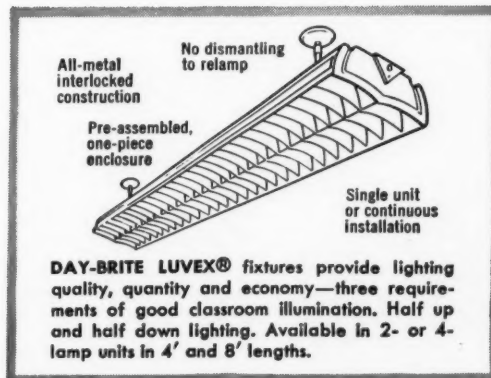
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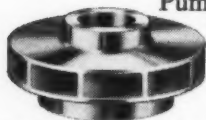
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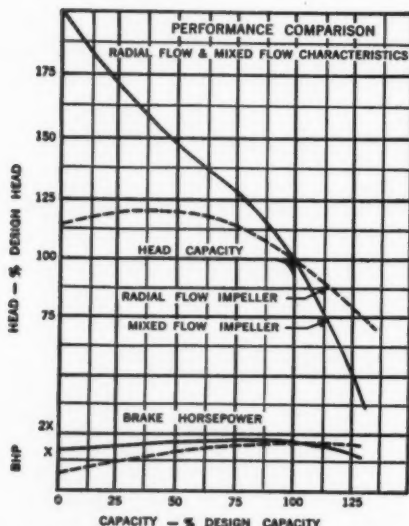
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condition seldom is encountered, it is essential that duly constituted governmental authorities anticipate such a problem, and be prepared to act through a pre-arranged procedure."

The objective of air pollution legislation is to recognize the right to the use of the air and the responsibility to avoid its abuse. The EJC group added that it is the duty of the engineer to assist in the preparation of legislation to accomplish this objective.

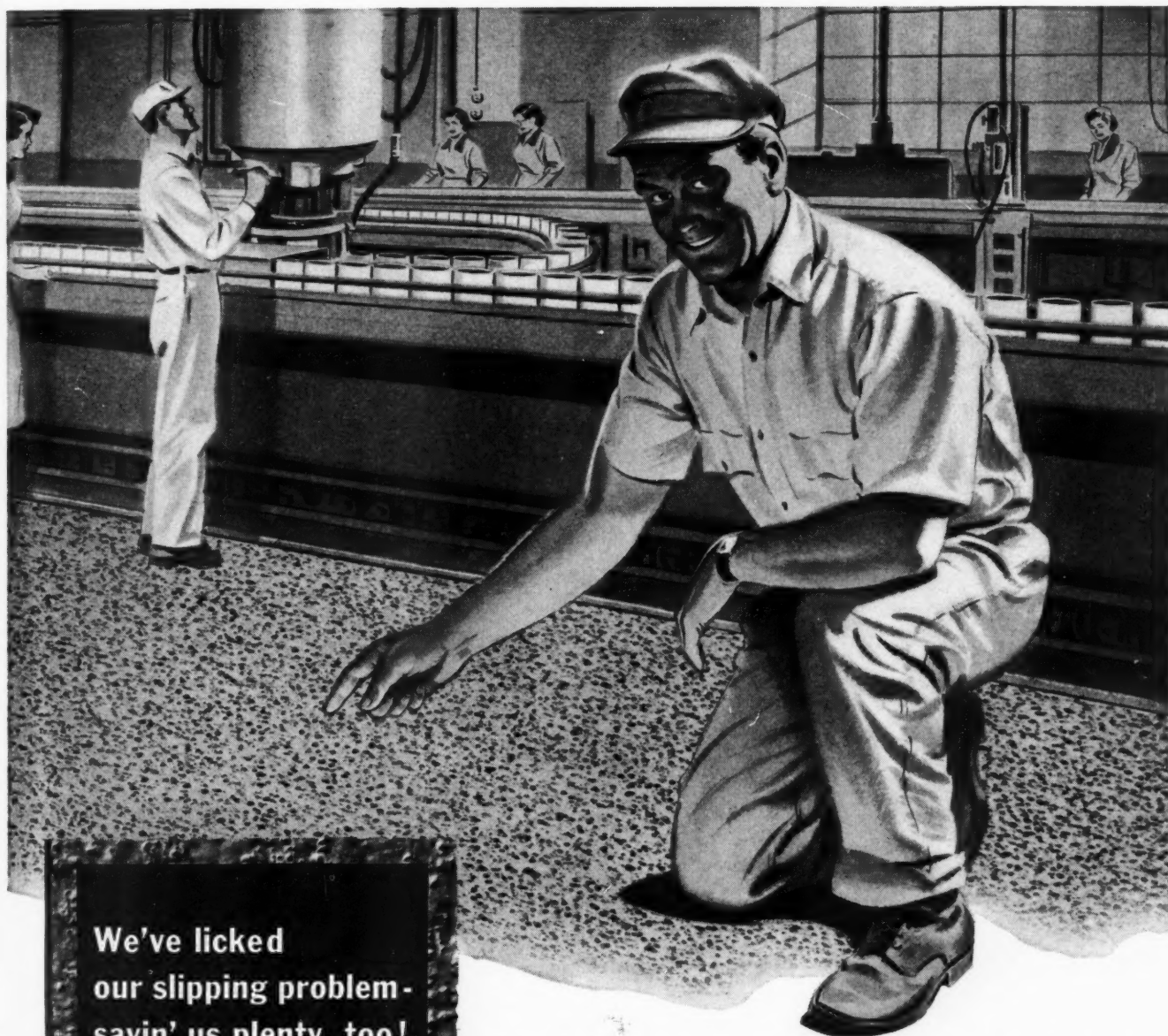
Research Needed

The EJC pointed out the urgent need for basic research in the field of air pollution:

"The unprecedented expansion of industries and increase in population has [sic] caused this problem to develop before basic research essential to an adequate understanding of the many factors involved was possible... In certain types and concentrations of pollution, relatively short times of exposure have proven fatal. The effects of long times of exposure to other types and concentrations are not as yet known. There is urgent need for basic research to develop more adequate knowledge in this area."

In urban areas, major causes of air pollution are the increase in industrial activity and the concentration of population. In rural areas, major pollution blame was put on excessive quantities of dust and vapors (both toxic and nontoxic) and on odors and pollen. "Considerable progress has been made in the development of methods for controlling the sources of such pollution through scientific soil management and other control methods."

Legislation at various levels of government may be desirable. Effective control can result only under legislation that is fair, yet provides adequate penalties for violations. "Responsible administration should start at the lowest government level capable of dealing with this technical problem. The public must be fully in-



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When you use Nalcite resins, you take advantage of Nalco's long and broad experience in water and process technology.

formed and accept the fact that each individual is both a contributor and a victim."

In expanding on the causes of air pollution, the report states that the exhaust from one car in proper mechanical condition is hardly observable. "Yet the exhaust from two solid lines of such cars passing through a tunnel becomes so lethal that an elaborate ventilating system is required. Conditions in a narrow street lined with tall buildings are scarcely better unless our natural ventilating system, the wind, dissipates the fumes."

Control Methods

Three methods recommended for control of pollution are:

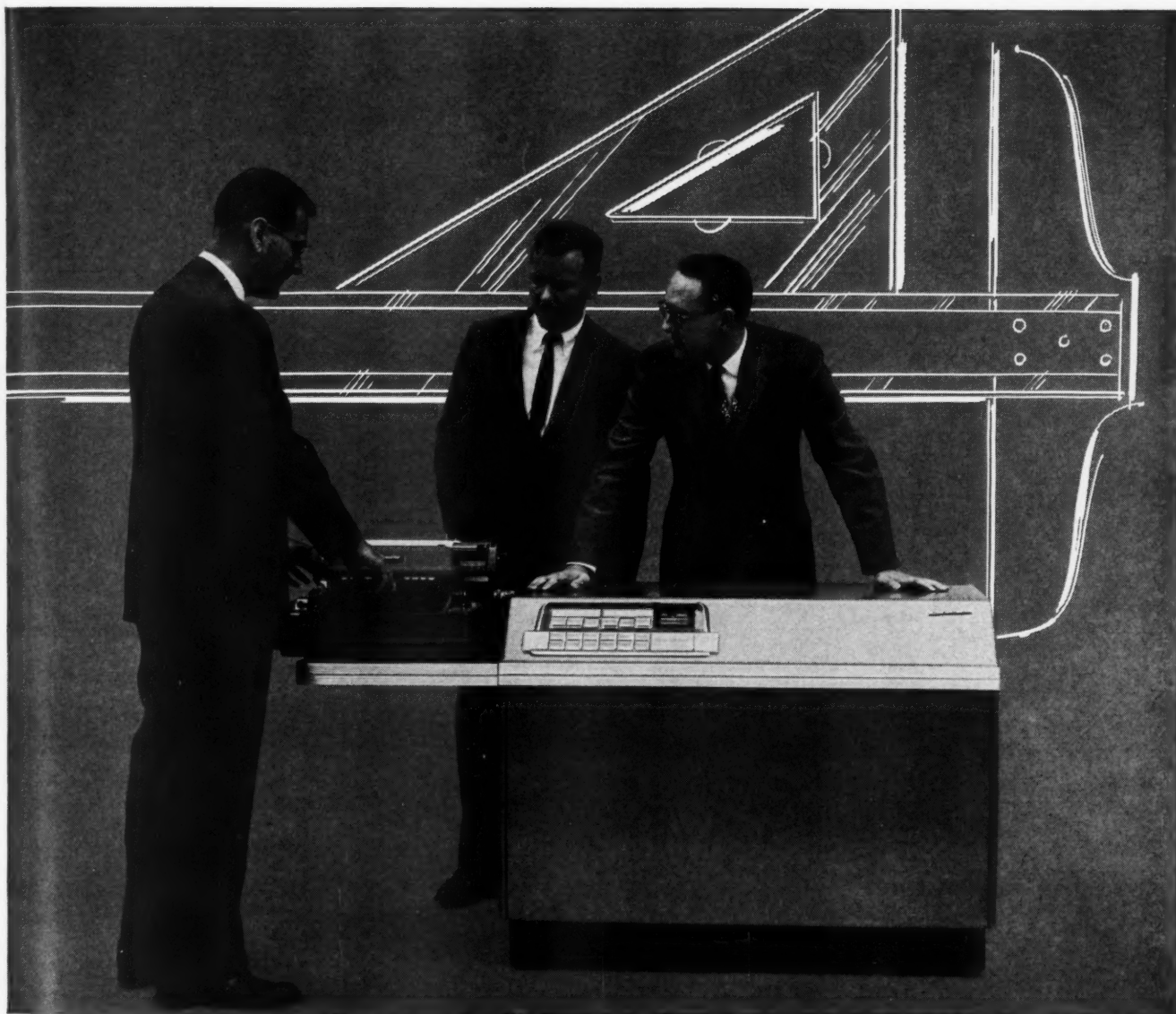
Dilution. By taking advantage of favorable factors, such as isolation from urban population and release of contaminants at reasonably high elevations, disposal by dilution can be satisfactory. (The method of approach is described as "age old.")

Abolition. The perfect solution, this consists of eliminating the source of trouble. While ideal, it sometimes is not practical.

Treatment. Among the methods of reducing the potency of pollutants before they are discharged into the atmosphere are superior combustion chambers, scrubbing facilities, settling chambers, filters, mechanical separators, electrostatic precipitators, and counteractants. "Where applicable, each of these devices has provided a significant contribution to air pollution reduction."

The report adds that the cost of air pollution abatement should be commensurate with the benefits received.

"Indiscriminate discharge into the atmosphere of waste materials which may become obnoxious or toxic, simply because no other method of disposal is known, no longer should be condoned. Scientific study and research for the satisfactory control of such discharges should precede the event, rather than follow it." ▲▲



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Faster answers; unusual capacity. With speed and memory (4096 words) comparable to computers many times its size and cost, LGP-30 gives you fast, effortless answers to such problems as cut and fill, grade profile, traverse closure, field stakeout, bridge design, highway alignment. Self-cooled, LGP-30 operates from any convenient wall outlet, gives you stored-program operation for greater flexibility. (For example, highway design geometry breaks down into approximately 14 different component problems; these may all be stored in the LGP-30 and used in whatever combination is required.) Thus

you save valuable time, cut costs, better your competitive position.

Easy to operate and program. LGP-30's remarkably simplified controls may be operated with only minimum computer experience. Answers are printed out directly... do not require deciphering. Programming is easily learned. A library of sub-routines, plus programs for a wide variety of applications, are available.

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**COMMERCIAL
POWER
DISTRIBUTION**



SAVINGS OF \$90,000 were obtained using G-E 480Y/277-volt systems in Exchange Bank, Braniff Building in background.

General Electric system-engineered equipment



PLANNING: W. Marshall, J. Glendinning, G-E; consultants J. M. Guerrero, E.B. Gamble; G.M. Bostock, Park V.P.



HIGH VOLTAGE LIGHTING at 277 volts creates savings by combining light, power source. Modular design permits flexibility.

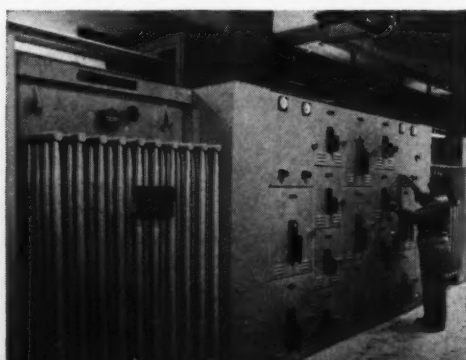


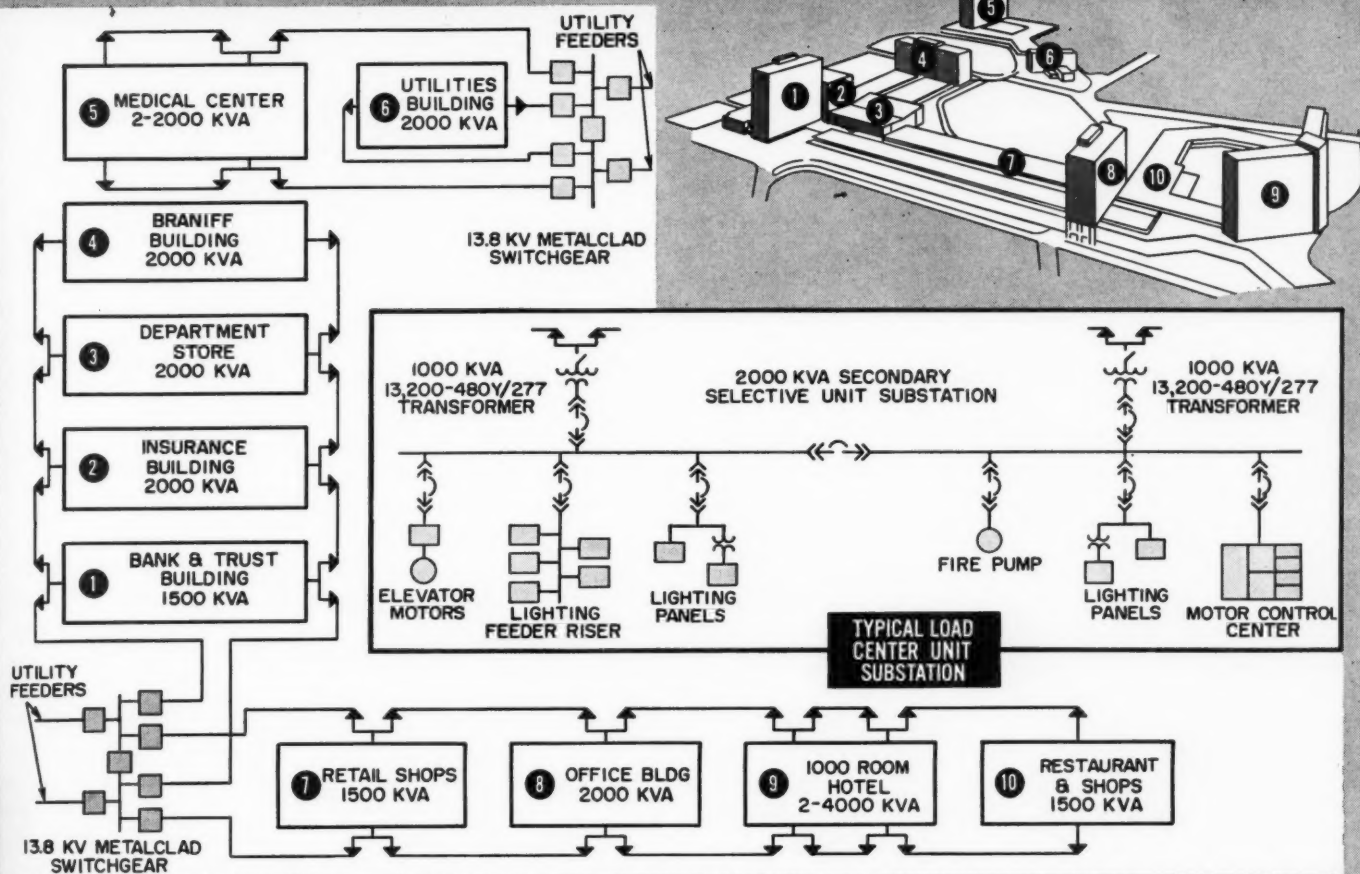
ECONOMICAL power distribution is provided by feeder busway. 30 kva, 110-V transformer serves office equipment.

COMPACT G-E Type DA7093 motor control center takes power from feeders to control all motors safely.

1500 KVA double-ended load center unit substation is typical of the units that will supply power in Exchange Park buildings.

PROJECT POWER is from two line-ups of G-E 13.8 kv metalclad switchgear. Unit shown is located in Bank basement.





FLEXIBLE, ECONOMICAL POWER distribution system for entire Park Project is contained in one-line diagram. Numbers

key equipment to Project buildings. Completed Utility Building also uses General Electric 480Y/277-volt equipment.

serves power needs of "city within a city"

\$125 million Exchange Park Project in Dallas shows how General Electric's "system approach" is key to flexible, economical commercial power distribution.

To keep pace with the Southwest's vigorous economic growth, a \$125 million commercial center is rising on 120 acres four miles from downtown Dallas. Known as Exchange Park, this community represents one of the most advanced city-within-a-city developments yet attempted in the United States. It is scheduled for 1960 completion. Nine major buildings, parking for 15,000 cars, 40-foot-wide air conditioned malls, 150 retail shops, and other facilities will enable shoppers to take care of every personal and business need in scientific comfort. Already completed: Exchange Bank and Utility Building.

SELECTING THE BEST POWER DISTRIBUTION SYSTEM, to satisfy Exchange Park's heavy load concentration efficiently and economically, required thorough system analysis early in project planning. G-E engineers, working closely with Mr. George M. Bostock, Vice-president and Engineering Manager of Exchange Park and his consultants*, recommended a 480Y/277-volt

secondary selective system as optimum. General Electric also provided basic system layout, service engineering and installation assistance at the site.

ADDED VALUES stem from adoption of G-E system recommendations. Exchange Park's 13.2 kv distribution system has capacity for load growth. Secondary selective system features permit reliable operation. Utilization of 480Y/277-volt system means fewer, less-metal circuits and substantial dollar savings. Using 480Y/277-volt equipment in only two of nine buildings, for example, saved \$90,000.

GENERAL ELECTRIC SYSTEM ENGINEERING CAN HELP YOU on your construction project. Call on G-E engineers early in your planning when they can be of greatest value. Contact your nearest G-E Apparatus Sales Office or write General Electric Co., Section 680-12, Schenectady 5, N. Y.

*Architect: Lane, Gamble and Associates

Consultants: Blum and Guerrero.

Electrical Contractors: Fischbach and Moore; Superior Electric Co.

Engineered Electrical Systems for Commercial Buildings

GENERAL  ELECTRIC



Beyond Our Borders

Power Development in the Belgian Congo

It has been 60 years since the first explorers penetrated into Katanga, a southeastern province of the Belgian Congo, a plateau area near the central basin of the Congo, rich in potential water power from waterfalls and rapids.

The Union Miniere du Haut Katanga, one of the leading companies engaged in supplying the western world with vital raw materials such as copper,

zinc, cadmium, uranium, radium, and germanium, in 1907 investigated the potentials of the waterways and rapids. But the prohibitive cost of effective engineering projects and lack of transport facilities at that time induced the young company to start exploitation of copper deposits by means of the fire-metallurgy process.

When it became certain that treatment of copper oxide ore by leaching and electrolysis was techni-

ICA To Encourage Private Enterprise Abroad

FROM POLICY DIRECTIVE 9—The U. S. is convinced that private ownership and operation of industrial and extractive enterprises contribute more effectively than public ownership and operation to the general improvement of the economy of a country through better management, research, quality control, lower prices, increased employment, and capital growth.

It is therefore a basic policy of the ICA to employ U. S. assistance to aid receiving countries in such a way as will encourage the development of the private sectors of their economies. Thus, ICA will normally not be prepared to finance publicly owned industrial and extractive enterprises, although it is realized that there may be exceptions.

RAY C. BURRUS, Associated Consultants, Inc.

American engineers often have found the atmosphere of socialization most confining when undertaking overseas industrialization projects sponsored by the Point IV programs. But over the past two years, the new managers of ICA, in the extension of technical aid and disbursement of our dollars to strengthen the internal economies of less advanced friendly countries, have tried to mend the mistakes of the past by bringing to the

forefront the basic concepts of private enterprise.

"Policy Directive 9" is a clear statement of an important Federal Government agency emphasizing our belief in the principles of free and competitive private enterprise. Henceforth, ICA, in its activities to assist underdeveloped countries to improve their domestic economies, will advocate private ownership of the tools of production as opposed to state ownership and operation of

cally feasible, blueprints for hydro plants for producing the necessary electric power were drawn up.

The first phase of construction work resulted in harnessing the Cornet waterfalls, 380 feet high, by the Francqui power plant, which was completed in 1930. A concrete dam, 547 yards long and 26 feet high, was built upstream. Later on, the height of the dam was increased by 13 feet to create a storage lake of 169 square miles with a capacity of 1700 million cubic yards. Production of the plant stands at 375 million kwh in an average year.

After World War II a second dam was built on the Lufira, five miles downstream from the Cornet Falls, using the waters of the Koni Rapids. The dam is of rock-fill construction with reinforced concrete facing upstream. Its storage lake, covering 1100 acres, has an available reserve of 16 million cubic yards. The aim of this reserve of water is not to regulate the river's flow, which is already handled by the Francqui dam, but to compensate for the daily variations in flow to the Bia power plant.

The spillway for the Bia station is capable of evacuating 24,700 cubic feet a second in the event of damage to the Francqui power plant or a flood in the river. The Bia dam, completed in 1950, has three turbo-generators totaling 46,800 kva and capable of producing 200 million kwh yearly.

Development of the metallurgical plants of the Union Miniere and the increase of energy consumption by the industry of the Katanga region, fed by the company's power plants, soon necessitated the exploitation of the Lualaba River, the upper part of the Congo. Over a distance of 43 miles, the level of this gigantic waterway drops 1560 feet, forming numerous rapids and waterfalls. The river's flow in this section is an average 3500 cubic feet a second.

Complete exploitation of this enormous potential will be effected by the construction of four power plants, two of which are already in service. The first, the Delcommune, finished in 1953, is an arch-type concrete dam 238 feet high and 532 feet long. The volume of the water it accumulates amounts to 3000 million cubic yards. The plant itself is fed by a tunnel and four penstocks. Four turbo-generators of 30,000 kva each are capable of producing 550 million kwh in an average year.

In 1952, construction on a new power plant, named Le Marinel, was begun. This plant exploits a water level drop of 600 feet some 22 miles downstream from Delcommune. The plant, constructed on the banks of a tributary to the Lualaba, the Seke River, is expected to produce yearly some 1430 million kwh, or as much as the Delcommune and the two other plants together. This dam is a rock-fill

those tools. In this sense, "Policy Directive 9" is a momentous proclamation.

ICA shares with the Department of Defense the responsibility for the administration of our almost \$4 billion-a-year Foreign Aid Program. ICA functions generally in the area of nonmilitary support and aid for many friendly small nations needing help and guidance in efforts toward general economic improvement. For the most part, these are the underdeveloped countries of the free world.

Engineers working abroad find their hosts convinced that national strength and a higher standard of living grows out of industrialization. Their goal is to secure for themselves the national strength that has been achieved in the United States through industrial development. All too often, unfortunately, these peoples have looked upon the visible part of an industrialization program, a factory or so, as the magic ingredient of better living and general prosperity. They have failed to understand the important need for private venture behind the brick and mortar of a factory or a mill. Again, most unfortunately, our official government representatives have not always made these facts clear to the fledgling coun-

tries that are seeking greater industrialization.

Korea is a typical example. There we have imposed upon a people, who never knew it before, the concept of state ownership of the tools of production. In Korea, under U. S. Government organizations (predecessors to ICA) we have built and are building numerous large scale manufacturing facilities, costing millions in U. S. dollars, all to be under Korean Government ownership and operation. The Koreans did not think up this concept. We did it for them.

In contrast, the Department of the Army, in its administration of the national development of the native peoples of Okinawa has insisted on the private enterprise route in helping the Okinawans develop their own economy to the limit permitted under occupation by our military forces. Private persons in Okinawa, singly and in corporate groupings, have been given a helping hand by officials of the Army in the establishment of a sound private enterprise economy.

"Policy Directive 9" is another way of saying that free enterprise is necessary to democracy. Engineers everywhere will applaud ICA for giving voice to this principle.

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dam with a water-tight sloping core, 223 feet high and 590 feet long. This type of construction was necessary because the character of the valley did not lend itself to construction of an arch-type dam. Work on this project was completed in 1955.

Water is brought from the lake by a gallery 2667 yards long piercing the ridge that separates the Lualaba valley from that of the Seke and ending in four penstocks 391 yards in length. Four vertical axis Francis-type turbines, each coupled to a 69,000 kva generator, equip the plant.

The Union Miniere and its subsidiary companies have set up a network linking stations and handling distribution of the power produced. The 110-kv network, starting at the Lualaba and Lufira stations, spreads some 324 miles and feeds major consumer centers such as Elisabethville, Jadotville, and Kolwezi. Other lines of 50-, 15-, and 6.6-kv capacity carry this basic system as far as the mining and urban centers. A new 220-kv power line, 314 miles long, links the Marinel station to Jadotville and Kitwe, establishing a connection with the Rhodesian Copperbelt network. Important quantities of power will be delivered, under contract, to Rhodesia over the coming years.

A dispatching center has been set up at Jadotville with a high frequency telephone system providing communication necessary to the operation of the four stations, operated in parallel, and the several substations.

The exploitation of the hydroelectric resources of the Katanga not only has permitted the expansion of the mining and metallurgical industry, but also the development of small and medium industries, and it has increased considerably the living standards of white and native populations.

Waste Product as Fuel

A 7850-hp gas turbine has been ordered from General Electric Co. by Compagnie Francaise de Raf-

finage, La Havre, France, for use at the Normandie refinery. The turbine will operate on tail gas, a waste product of the refinery, which has a heating value of 500 Btu per cu ft.

The gas will be mixed with the air compressed by the gas turbine's axial flow compressor and burned in the unit's six combustion chambers. The hot combustion gases will pass through the two-stage turbine, which will drive propane and ethylene compressors integrated with the refinery process, and then will be piped through a heat recovery boiler to produce about 30,000 lbs per hr of process steam.

Delivery of the gas turbine is expected to be made early in 1958.

New Building Material

An Estonian scientist, Johannes Hind, is credited with having invented a new building material known as silicalcite. Manufactured from specially prepared sands and limestones it can withstand pressures of 1700 kg per square centimeter. This is comparable to the strength of pig iron, while weighing only a quarter as much.

Silicalcite products can be used in place of clay or Portland cement products and are much cheaper. Produced only on an experimental scale at present, walls made from silicalcite cost between 104 and 114 rubles (\$26 to \$28.5) per square meter. It is estimated that commercial production would cut this price in half.

The key to the production of silicalcite is the "disintegrator," a barrel-like machine in which grains of sand are subjected to a succession of pulverizing blows by six wheels with projecting fingers that rotate at a high speed, three in each direction. At the same time, the sand is mixed with slaked lime, both of these materials being fed into the disintegrator from measuring bunkers over the machine. The resultant product is a light grey floury powder.

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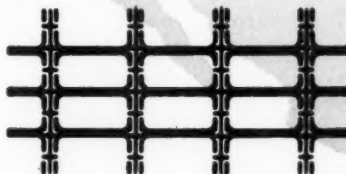
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are manufactured from this silicalcite, either in a process similar to that for the manufacture of precast concrete parts, or by the manufacture of parts in two layers. In the latter method, one layer is made of compressed silicalcite, while the other is formed of silicalcite-foam, a mixture of silicalcite and a foam prepared from joiner's glue, soapstone, or rosin. The parts have only a thin layer of the compressed silicalcite with a foam layer about 26 cm thick. Walls made of the two-layers have better thermal insulation.

Cement factories are being converted to produce silicalcite and production of silicalcite parts has already started in Serdobsk and in Penza Oblast. Preparations are being made also for factories in 54 towns of the Soviet Union.

Japanese Irrigation Project

To assist in the execution of a multi-purpose program for irrigation, water supply, and power in the Aichi region of central Japan, the World Bank has made a loan equivalent to \$7 million to the Aichi Irrigation Public Corp. The program will make it possible to increase the production of food crops by about 200,000 tons annually. In addition it will supply drinking water to numerous towns and villages, provide more water for industry in three cities, including Nagoya, Japan's third most important industrial city, and increase the power supply of the region.

The most important feature of the program will be the perennial irrigation of 42,000 acres of land already under paddy and of 40,000 acres of upland areas. This will be Japan's first attempt to irrigate ridge lands. The experience gained in the Aichi region will demonstrate the feasibility of using the same techniques on very much larger areas of similar land in southern Japan. To feed its population of 90 million, Japan now has annual food imports costing the equivalent of \$600 million

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Plant Engineer

*Excerpt from a letter written by the Plant Engineer of one of Firestone's foreign subsidiaries.



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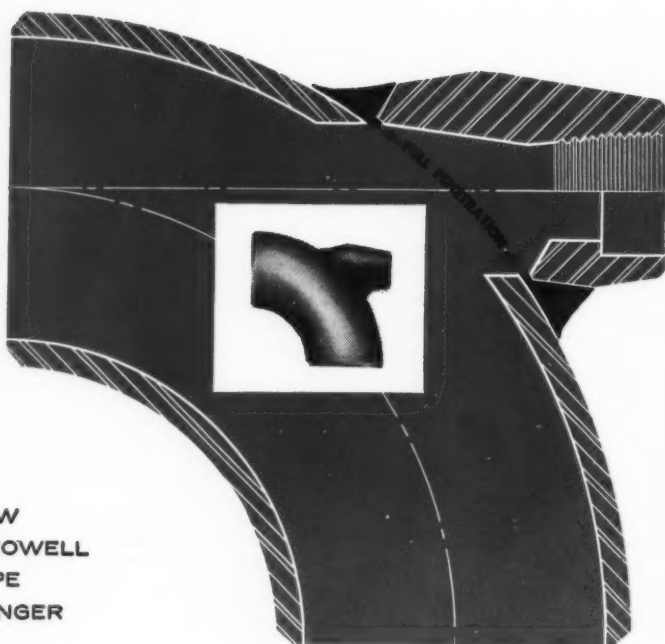
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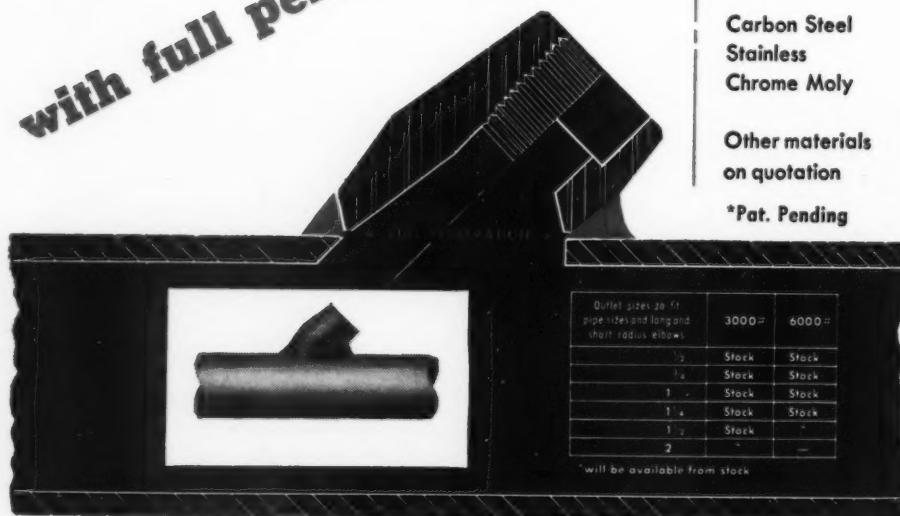
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in foreign exchange. With the population increasing by one million a year, the food deficit will be much greater unless domestic production can be increased.

The Aichi Irrigation Public Corp. is a government agency, formed in October 1955, to plan and execute the project. The project is expected to take four years to complete at a total cost equivalent to about \$100 million. The Bank's loan will pay for the importation of heavy machinery for the construction of a dam, canals, and reservoirs; services of irrigation and construction consultants; and the training abroad of a few key personnel in the techniques of ridge land irrigation.

The main features of the Aichi program are the construction of a dam at Makio Bridge on the Otaki River and regulating reservoirs capable of impounding 117 million cubic yards of water; a 10,000-kw electric power plant; a 68-mile main canal running southward along the ridge of the Chita Peninsula to its end; about 780 miles of secondary canals; ditches or sprinkler irrigation mains at the discharge points of the secondary canals to bring water to between 20,000 and 30,000 farms; and canals to bring water to municipalities for domestic and industrial use.

The Bank has now made eight loans in Japan, totaling \$83 million. One of the previous loans was for a land reclamation project also designed to increase agricultural production. The others were for electric power development, steel production, and various other industries.

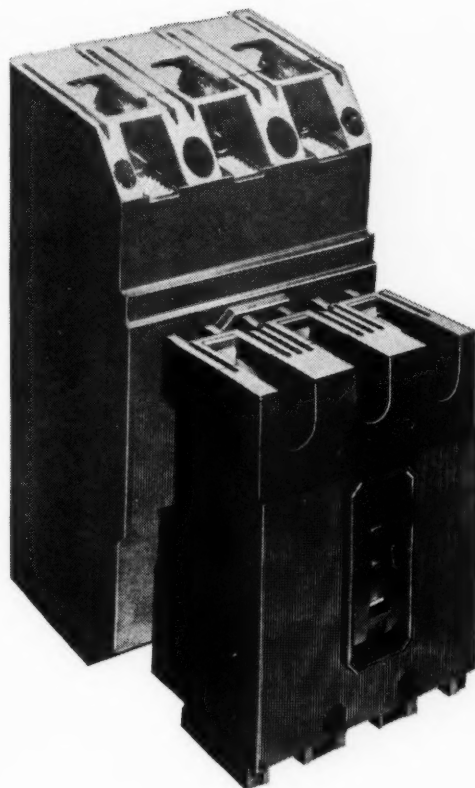
Hydroelectric Scheme Completed

The second phase of the hydroelectric scheme at Mabubas, in Portuguese West Africa, is now completed. For the past few years Mabubas has been the source of electric energy for the capital of Angola, and though the completion of the second and final stage of the scheme will satisfy present requirements, thought

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The new "EH" frame breaker is ideal where intermediate voltage and interrupting ratings must be handled, and space is at a premium. Specify the I-T-E "EH" frame and benefit from the compact design advantages which this new circuit breaker provides.

Contact your local I-T-E sales office or write I-T-E Circuit Breaker Company.



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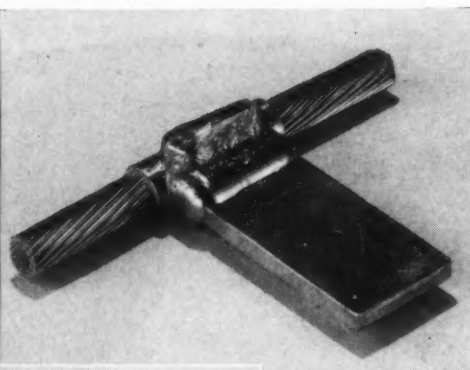
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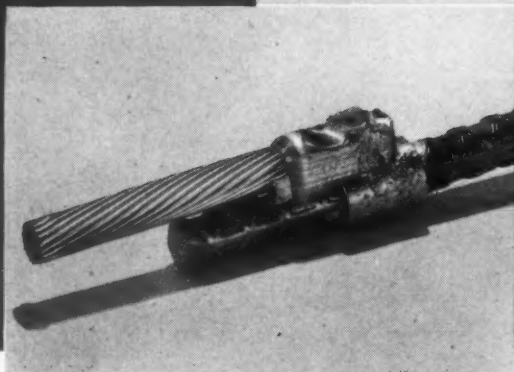
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already has been given to the construction of another, larger hydroelectric scheme to harness the Cuanza River.

New Construction in Spain

Since the revolution which ended in 1939, Spain has experienced an era of tremendous building activity, according to Harold S. Langland, of Stanley Iron Works, Inc., Minneapolis. Langland, a past president of the National Association of Architectural Metal Manufacturers, recently completed a tour of Spain.

The status of much of this activity is somewhat uncertain. Some of the very large structures in Madrid have been completed; others stand row upon row of 10- to 15-story structures, in skeleton attire, evidence only of great ambition.

The early skeleton work often is steel, with concrete beams and slabs and the inevitable cantilever slabs for balconies. Wall construction is of masonry, often of red brick contrasting with the lighter color of the exposed concrete slabs.

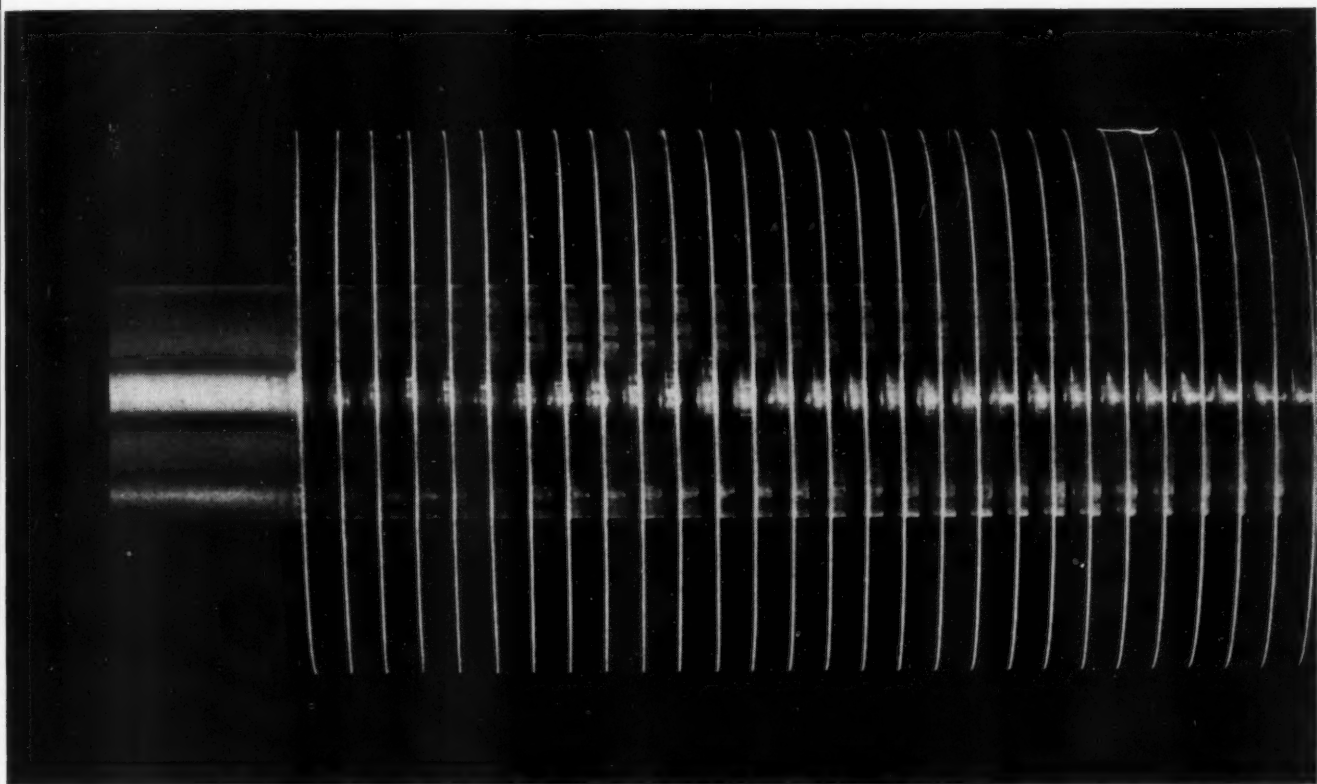
Steel stairs are never used. In the skeleton structures the concrete stairs can be seen through the open walls, laboriously built with elaborate form work and extending to the top floors of the high buildings. Metal railings are used extensively on the exterior of the buildings.

Metal fire escapes are non-existent, since there are few fires in these masonry structures.

Structural steel is being used more extensively, although Madrid has the largest masonry building in Europe — the 26-story Plaza Hotel.

Uses of aluminum in Spain include the structural riveted framework of roofed-over enclosures for fairs or fiestas. Aluminum is being introduced at an aggressive rate, mainly by the Manufacturas Metalicas Madrilenas, the largest fabricator of aluminum in Europe. Billets come mainly from Canada and from

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—less power per c.f.m.**

Aerofin smooth fins can be spaced as closely as 14 per inch with low air friction. Consequently, the heat-exchange capacity per square foot of face area is extremely high, and the use of high air velocities entirely practical. Tapered fin construction provides ample tube-contact surface so that the entire fin becomes effective transfer surface. Standardized encased units arranged for simple, quick, economical installation.



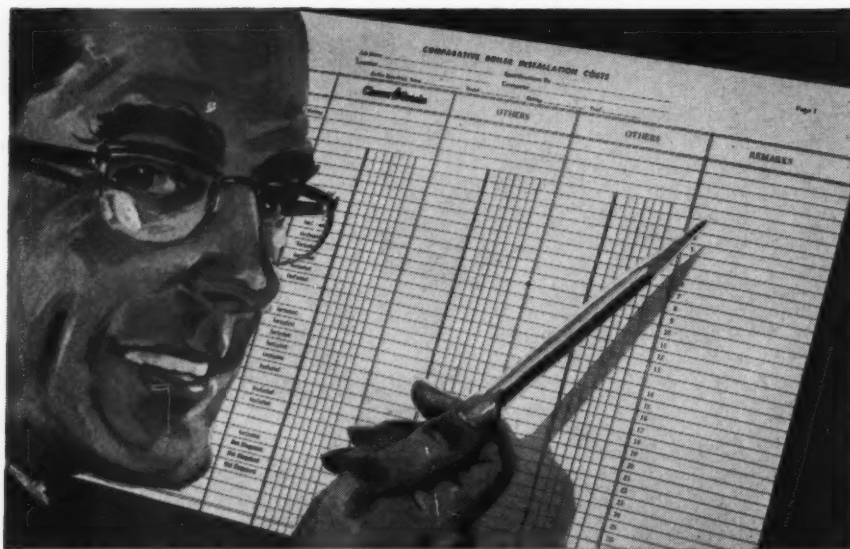
AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

*Aerofin is sold only by manufacturers of fan system apparatus.
List on request.*

Write for Bulletin S-55

Before you buy any boiler compare quoted prices with **REAL COSTS**



New Cleaver-Brooks cost analyzer clears "quotation" confusion — reveals ALL costs

Get *all* the costs... the *real* costs... down on paper before you recommend or specify a boiler to your clients. On many boiler installations "quoted prices" seldom agree with the total costs, as you may have learned. This is frequently the case with so-called "built-up" boilers assembled on the site.

Cleaver-Brooks' cost analysis enables you to compare all material costs (boiler, steam trim, burner, refractory, controls and other equipment) and installation labor costs. You'll know the "real costs" on the complete installation before you start.

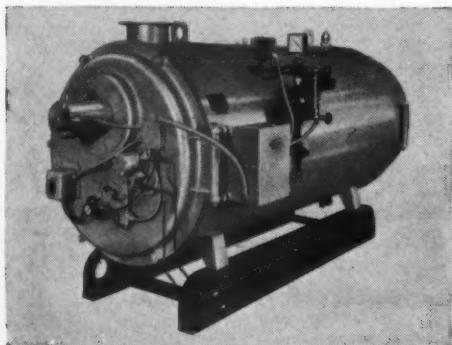
Real eye-opener

The figures you'll see may be startling. In most cases the cost analysis proves a Cleaver-Brooks costs *less*. On-job time is dras-

tically reduced because Cleaver-Brooks packaged units are fully assembled, ready to install. Cleaver-Brooks boilers give you more in performance, too... each boiler is fully fire-tested at the factory under load, tuned to peak economy. Starting service and on-the-job operator training by authorized field engineers further decreases your over-all costs.

Contact your Cleaver-Brooks agent

Once you add up all the benefits of a Cleaver-Brooks "one-cost" package... the proved trouble-free economy of exclusive four-pass, forced-draft design, you'll find it pays over and over to analyze costs carefully before you buy. See your Cleaver-Brooks agent for details or write Cleaver-Brooks Company, Dept. M, 321 East Keefe Avenue, Milwaukee 12, Wisconsin.



Choose from 19 sizes, 130 models, 15 to 600 hp. Oil, gas and combination oil/gas fired — steam or hot water for heating or processing.

Cleaver Brooks

ORIGINATORS OF SELF-CONTAINED BOILERS

Norway, the only European country with a surplus of aluminum.

Curtain wall construction in metal has not been attempted to any degree in Spain, metal being in short supply as compared with masonry of all kinds.

Public school building is almost non-existent in Spain, since children attend either private or parochial schools. There are no public schools below those of college level, which are either government or church operated.

India's Engineering Problems

It is now about two years since India embarked on the implementation of her second five-year plan, now estimated to cost Rs. 60 billion, a little more than \$12,000 million.

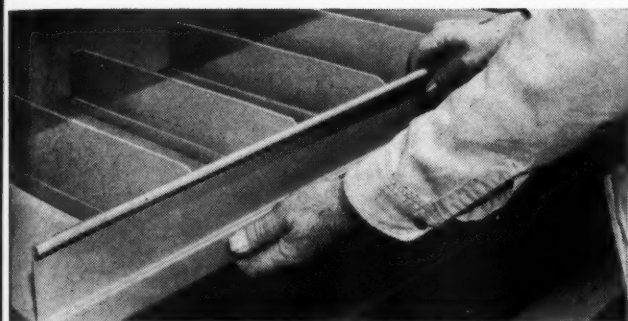
Important among the projects are construction of a number of mammoth multi-purpose dams, erection of three steel mills, exploration of oil resources, and the lignite exploitation project in south India.

Original estimates for the second five-year plan, with emphasis on development of industries and power, were of the order of Rs. 40 billion. But the increase of 20 billion rupees cannot be accounted for fully by rise in prices and the situation brought about by the Suez Canal debacle. Inefficiency, gross errors in estimating, and waste are said to be considerable factors.

There have been a number of mentions in the press that there is an obvious shortage of engineers even in the field of civil engineering, and an almost total lack of engineers with training for industrial plant design and construction. In 1955, about 3100 engineers were graduated in India, while 6000 lesser diploma holders became available to fill junior posts.

Foreign collaborators on the three steel plants, in addition to offering technical assistance, have agreed to take on Indians for training. Groups interested in exploration and utilization of oil

Only New HALLOWELL *ERECTOMATIC*. Steel Shelving



STRAIGHT-IN, STRAIGHT-OUT SHELF CHANGE. No tilting. No dismantling. No interference with any other shelf.



INDEPENDENT SHELF POSITIONING. Each shelf can be repositioned individually in seconds.



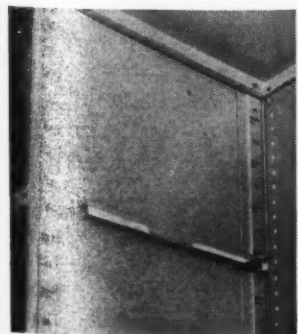
FULL USE OF SHELF AREA. No tees or angles, and beaded posts save valuable space.



COMMON SIDE PANELS AND POSTS save material between adjacent units in a rack. Back and side panels are one-piece.



BEADED POSTS AND FLANGED SHELVES prevent snagging of clothing or stored goods, protect workers.



FULL DEPTH SHELF SUPPORT. No buckling possible. Reinforcements can be added when required.

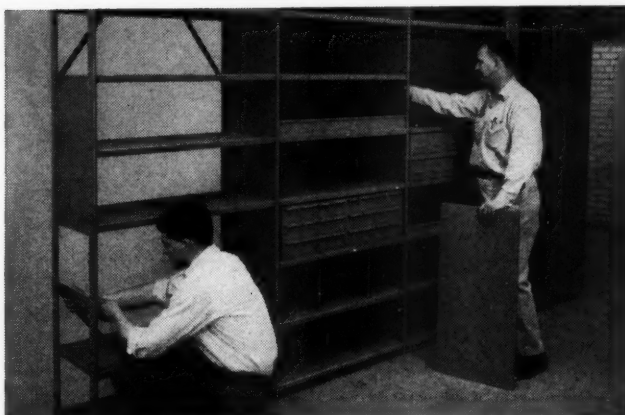


4 CLASSES OF SHELVES. Regular, medium, heavy and extra-heavy construction meets all load requirements.

**cuts assembly time,
permits fast repositioning of shelves
—gives you these plus features**

No matter what type of shelving you need—open, closed, bin units, ledge units, counters or cabinets—new Hallowell *ERECTOMATIC*® steel shelving makes the job easy. The unique built-in locking device*—developed by SPS—speeds assembly and rearrangement of shelves. To position a shelf, slide it into place on the shelf supports, press the locks, and the shelf is locked. To reposition a shelf, release the locks, pull the shelf straight out, slide it straight in on its supports at the new location, and press the locks. It takes only seconds to do the complete job. Made of prime steel, phosphate coated, and finished in SPS green baked-on enamel—other colors are available. Hallowell *ERECTOMATIC* steel shelving is stocked by leading industrial distributors and shop equipment dealers. For complete information, see the one nearest you. Or write Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 66, Pa.

*Patent applied for



TWO MEN ASSEMBLED new Hallowell *ERECTOMATIC* steel shelving in just over 10 minutes. Closed unit was 36 in. wide, 18 in. deep, 7 ft. 3 in. high, complete with seven shelves. Standard models of other design required 13-55 min. Table shows test results.

Brand	Time to Assemble (Min.)	Units Per Hour
Erectomatic	10.42	5.75
A	13.23	4.53
B	14.24	4.21
C	16.30	3.68
D	18.12	3.31
E	25.03	2.40
F	55.03	1.09

HALLOWELL SHOP EQUIPMENT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

The **Size**
Type
Rating
Quality

to meet your
most exacting
requirements



Twist-Lock®

Illustration, below, shows size relationship of a Hubbell 4-wire, 50 amp. Twist-Lock cap and a midget 2-wire, 10 amp. Twist-Lock cap... a good indication of the wide range of sizes and ratings available



If your plans call for a lock-type electrical connection, "Twist-Lock" by Hubbell represents the finest, safest and most complete line ever developed. Caps, connector bodies, motor bases and receptacles are available in a wide variety of types and sizes, and in the ratings to conform to your electrical specifications.

Every cap and connector body from 10 amp. to 50 amp. is now available with "Seal-Tite" rubber covers for weatherproofing purposes, protection from dust and dirt or from hard knocks and rough usage.

"Seal-Tite" Rubber Covers for the complete line of "Twist-Lock" caps, cord connectors and male and

female flush receptacles are recommended wherever moisture or breakage is a problem. Rubber closure plugs are also available for most "Twist-Lock" male and female receptacles.

"SEAL-TITE" RUBBER COVERS



"Seal-Tite" Rubber Covers feature a "bellows" action which effectively seals out moisture, oil, dust, dirt, lint, metal chips, etc. There is a "Seal-Tite" rubber cover or closure to fit every "Twist-Lock" device.

Write for 4-pg. brochure presenting the complete "Twist-Lock" Line.

**HARVEY
HUBBELL, INC.**

HIGHEST QUALITY
WIRING DEVICES • MACHINE SCREWS

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WIRING DEVICE WAREHOUSE LOCATIONS

Scarborough, Ontario, Can.
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Los Angeles 12, California
103 North Santa Fe Avenue
San Francisco, California
1675 Hudson Avenue
Dallas 7, Texas
1111 Dragon Street

and other new industries have made similar offers.

The question is now whether these projects should first be undertaken and engineers trained on the job, or whether engineers should be trained first before projects are undertaken.

Technical Laboratory Center

Drs. Milton E. Nelson and C. Roland McCully, of Armour Research Foundation of Illinois Institute of Tech., left for Bogota, Columbia, recently to serve as research advisors at the first laboratory center in Columbia established specifically for technological research. Nelson will advise the director of the laboratory center on administrative techniques. McCully will serve as research operations advisor and will instruct the Colombian staff in the techniques of industrial research. They join John Farmer, ARF mechanical engineer, who has been serving as resident engineer at the center since 1956.

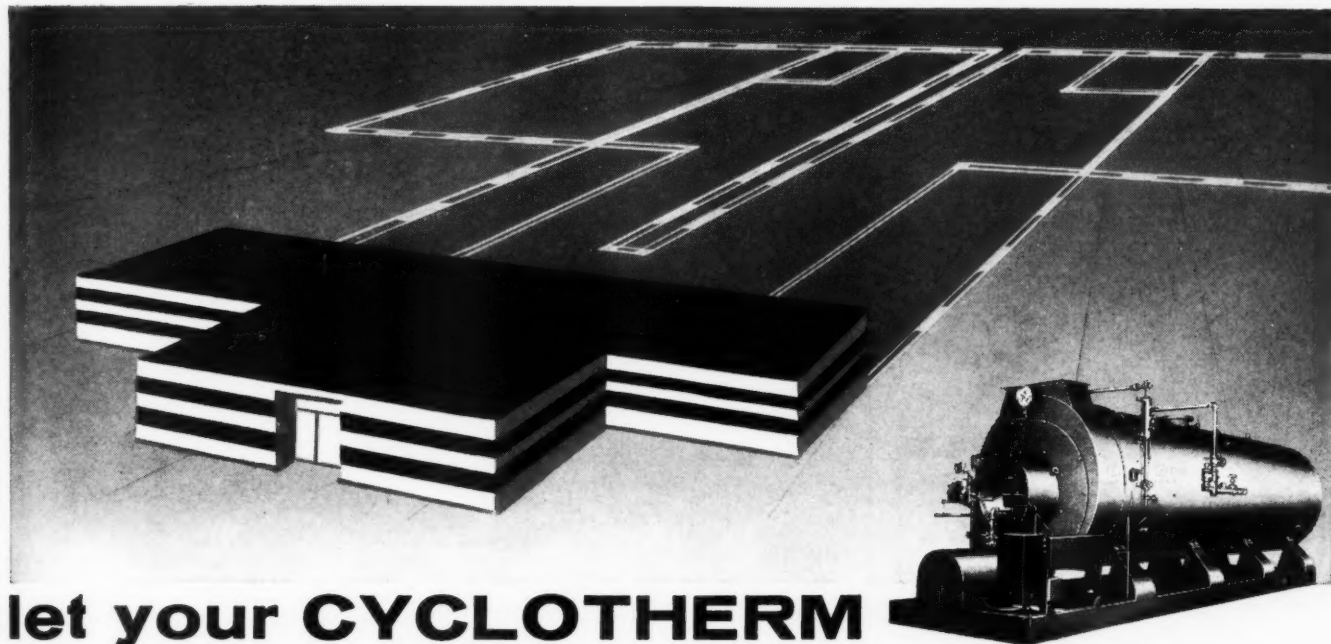
The South American center, known as the Instituto de Investigaciones Tecnológicas, was established in Bogota in 1955 by the Agricultural, Industrial, and Mining Credit Bank of Columbia, with the technical assistance of Armour Research Foundation. Research operations at the center are aimed at broadening the economic base of Columbia by the development of its vast agricultural potential.

Work currently is underway to extend the use of insecticides, fertilizers, and agricultural machinery. In addition to work being done at headquarters in Bogota, research on termite resistance of materials for prefabricated houses and field studies on fertilizers and insecticides are being conducted at experimental stations in outlying areas.

Largest Walking Dragline

The world's largest walking dragline has just been placed in service at an opencast ironstone quarry in Lincolnshire, England.

For a five year plan or a fifty...



let your CYCLOTHERM installation grow with your plant

How much steam will you need five years from now? Or ten? It's easy to blueprint your steam generating future with Cyclotherm Steam Generators. Cyclotherm permits you to add boiler horsepower as you need it. Units from 18 to 750 HP, in 18 sizes. You can add Cyclotherms to your steam capacity like a child adding blocks to a house.

The Cyclotherm is particularly well adapted to multiple installations. It's compact—takes up to one-third less space than other package boilers. It needs no excavation, no foundation. A simple flue takes the place of a towering stack. Completely assembled before shipment, the Cyclotherm is a working unit the minute it reaches your plant. And one manufacturing responsibility stands behind the entire equipment—boiler, burner, instrumentation and all.

Cyclotherm's Cyclonic Combustion guarantees a minimum of 80% efficiency in only two passes. Larger units operate at from 30% to 100% of rated capacity without losses of efficiency—smaller units operate on or off automatically as load requires. Maintenance costs cut as much as 50%. And the world-wide Cyclotherm service organization is always at your disposal. We'd like to plan your steam-generating future with you. Remember too that Cyclotherm is the only manufacturer who has specially designed a complete line of hot water boilers, output per hour from 670,000 to 6,700,000 BTU. Fill out the coupon and a Cyclotherm sales engineer will call.

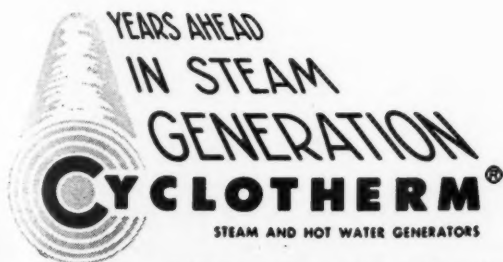
At J. D. Jewell . . .
One Cyclotherm in 1949;
Five Cyclotherms Today

One of America's largest chicken processors is J. D. Jewell, Inc. (Jewell Whole Cut Up Chicken, Jewell Chicken Pie, etc.) of Gainesville, Ga. And here's how Jewell's growth has been matched by Cyclotherm installations:

1949	100 HP Cyclotherm
1954	150 HP Cyclotherm
1955	18 HP Cyclotherm
1956	80 HP Cyclotherm
1957	150 HP Cyclotherm

And when Jewell processes more chickens, it will have more Cyclotherms to help process them!

Clip to Your Letterhead



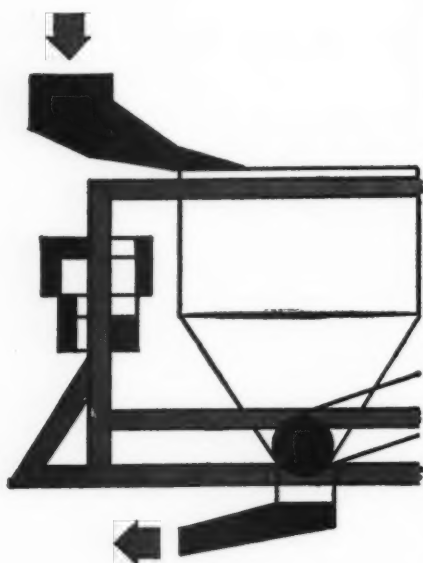
A Division of National-U.S. Radiator Corp., Oswego, N.Y.

Cyclotherm Division
National-U.S. Radiator Corp.
36 E. First St., Oswego, N. Y.

Please send me your booklet *Cyclotherm Cyclonic Combustion*, also rotogravure copy of *Cyclotherm Sales Steam* with illustrations and descriptions of Cyclotherm installations.

UNITIZED WEIGHING

**provides automatic
batching**

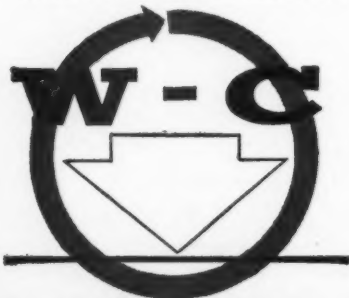


For sequence or continuous automatic batch feeding, W-C offers pre-engineered, "building-block" systems to meet virtually all requirements.

- Batch-in or batch-out
- Solids and liquids
- Single or multiple materials
- Ratio batch and proportioning

In a full range of sizes, you have your choice of weigh hoppers, feeders, weight transmitters, scales . . . semi-automatic or fully automatic controls, either "on-the-spot" or remotely located. You also have your choice of electric or pneumatic operation plus the overall flexibility and economy that only W-C UNITIZED WEIGHING Systems offer in fulfilling present and future weight batching requirements.

Write for descriptive literature.



WEIGHING & CONTROL COMPONENTS, Inc.
206-F Lincoln Avenue

The machine was built at a cost in excess of \$2 million, takes 30-ton bites at the overburden, and can shift its own weight (1675 tons) every hour. The jib is 282 feet long. The machine can walk in any direction taking steps of over six feet. Power is supplied by 1500-hp generators from 6600-v mains to 14 main driving motors. Total crew is one man.

Transparent Roof

A seven-story building with a transparent roof and exhibition rooms in the center has been erected in Gothenburg, Sweden's second largest city, for the Swedish Fair Administration (Svenska Massan).

Birger Ludvigson was the consulting engineer, Kullenberg Byggnads AB the builder, and Nils Einar Eriksson the architect.

TAMS to design Taiwan Dam

Under terms of a contract signed with the International Cooperation Administration, the New York firm of Tippetts-Abbett-McCarthy-Stratton will furnish engineering services for the design of the largest single economic development project ever undertaken by Taiwan (Formosa) — the multipurpose Shihmen Dam Project which may cost \$40 to \$50 million to complete.

The Republic of China will pay most of the cost with Chinese currency. ICA has allocated \$7.8 million to cover the cost of providing American engineering and construction advisory services and procurement of imported equipment and supplies.

Work on the project has been in progress for more than a year under the direction of the Shihmen Development Commission, an agency of the Chinese Government. The commission succeeded the Shihmen Planning Commission under whose direction engineering studies were conducted and preliminary plans developed.

The contract takes the place of a "letter of intent" under which the engineering firm (TAMS)

has been proceeding with initial phases of the work since June. It provides for TAMS to prepare final designs for the entire construction project, to assist in the procurement of major equipment items, and to inspect the construction work. A separate contract for construction advisory services will be negotiated later and the services made available to the Commission's dam construction department which will engage in the actual construction work.

As planned by the Chinese, the project will create a reservoir of 316 million cubic meters capacity; provide an assured water supply for irrigation covering 135,000 acres of two-crop rice fields; provide a hydroelectric power plant with an ultimate installed capacity of 120,000 kw (40,000 kw initially); provide flood-control for the protection of Taipei City and the lowlands along the Tanshui River; provide and improve public water supply for 340,000 urban population, and provide incidental benefits in the area through improvement of streams.

Continuous Rails

First continuous rails designed by the Soviet engineer Bechenkov are reported to have been tested in the USSR. The sections, which run as much as one kilometer in length, are welded from single rails. They are housed in special blocks placed on the sleepers, permitting expansion and contraction of the metal as temperature varies.

Special devices allow free level movement of the rail ends. The design prevents the rails from shifting as the train passes along them. This is done by a system of springs, one edge of which rests on the rail and the other on the ties of reinforced concrete foundations that are placed in the middle of each section. These allow the rails to return to normal position after the train has passed. Advantages of the new system are savings in the wear of rolling stock and use of lighter rails. ▲▲

News for the Consultant



City and Regional Planning Urged

Referring to what he termed Missouri's "miserable record" on legislation to promote good planning in the state, Eldridge Lovelace, partner in the city planning and civil engineering firm of Harland Bartholomew & Associates, St. Louis, said his state's record in providing the tools to do an effective job of community planning is poorer than any of the eight states surrounding it. His remarks were contained in a speech presented at the Missouri Municipal League annual meeting in September.

Citing the need for planning as the only way to take advantage of an area's resources, he said that

the character of a community is determined by the manner in which a great many separate factors are combined. "Our cities are made up of many small parts. There aren't really many big things such as expressways or major airports. Instead there are many individual buildings . . . miles of streets . . . many individual sewers, water mains, culverts. When these parts are fitted together with forethought, care, discernment, and some good over-all

ACCURATE LABORATORY OR JOB-SITE TESTING...

improves quality control prevents over-design lowers project costs

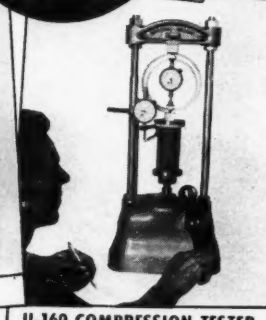
ON ALL CONSTRUCTION!



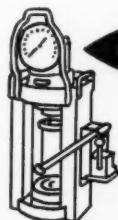
CN-980 VOLUMEASURE



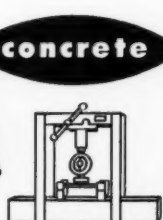
CL-392 SIEVE SHAKER



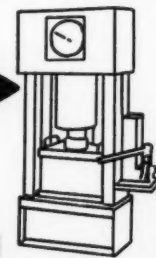
U-160 COMPRESSION TESTER



CT-711 CONCRETE
TESTER



CT-375 BEAM
TESTING MACHINE



CT-900 CONCRETE
BLOCK TESTER

Engineering Test Apparatus for Soils, Construction Materials, Concrete and Asphalt ranging from single items to self-contained Mobile Laboratories are available for immediate shipment.

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AP-350 VERSA-TESTER

asphalt

design, they can make a community that is pleasant . . . and economical. Put together helter-skelter and haphazardly, these same pieces make a city characterized by slums, blighted districts, congestion, and tax problems.

"What we really mean by planning is some method or system whereby we can guide and direct these small parts in such a manner that the over-all result is a good community. This can be done by the development of a realistic and practical comprehensive city plan . . . in such detail that it may be applied to the use of every parcel of ground in the city and applied today . . ."

He predicted that in the future, planning will be necessary on a regional and county level rather than on a narrow city basis.

One of the eight states touching on Missouri recently received a report on a proposed regional study on slum clearance and flood conditions from Blair Associates, planning consultants and development advisors. The report estimated that a two-year study in eastern Kentucky would cost about \$100,000. The eastern Kentucky Regional Planning Commission would use the money to pay expenses, salaries of technicians and other personnel, and to buy equipment.

As recommended by Blair, the two-pronged study

would include flood plain zoning and urban renewal and industrial site development.

Flood zoning would offer a guide to development of land in the flood plain and reduce danger from high waters. The zoning also would encourage eastern Kentucky residents not to build homes in flood areas and would reduce the possibility of blocking floodways with low-lying bridges and buildings.

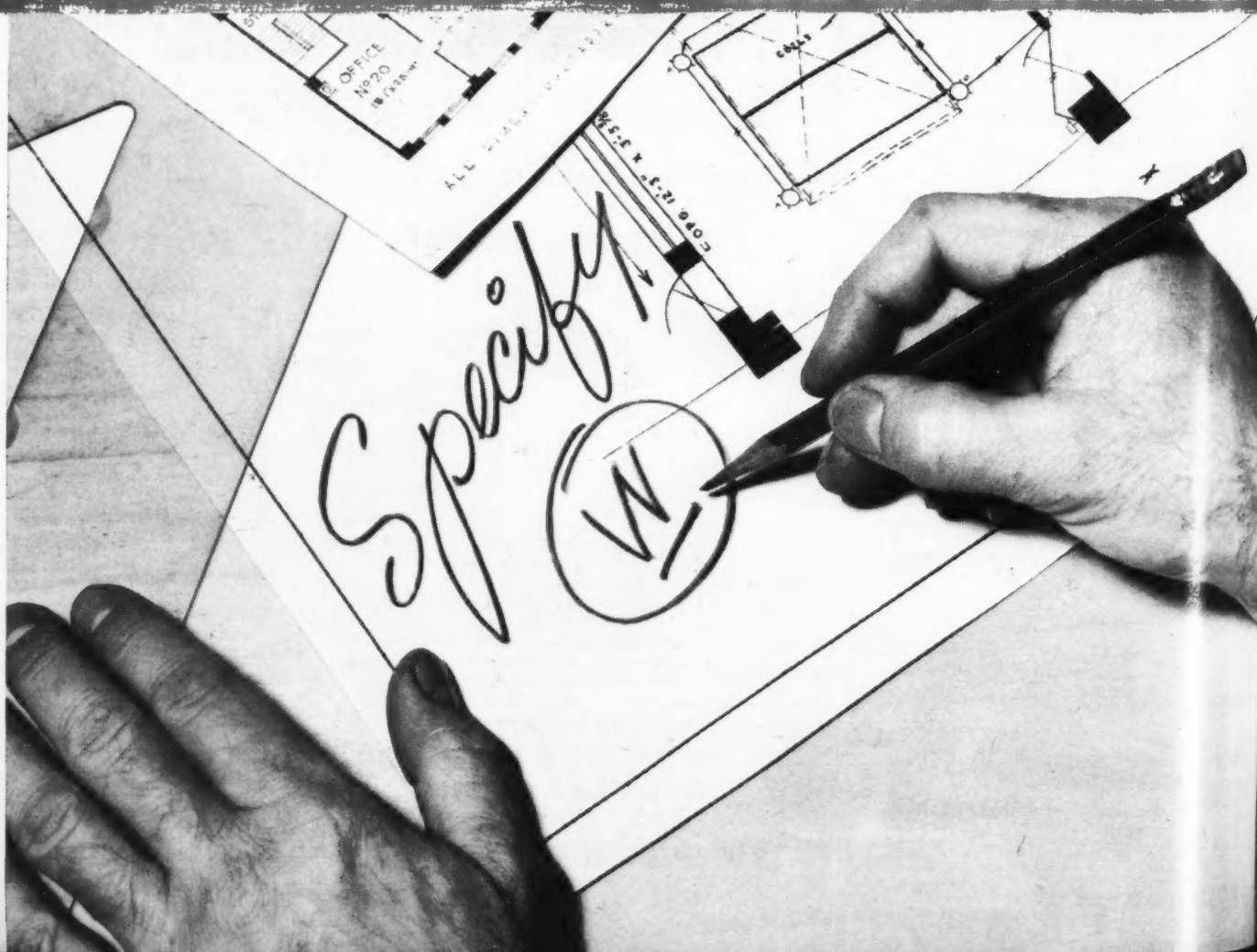
Urban renewal would clear blighted urban areas and replace them with more desirable structures.

The Blair report indicated that each of the studies could be completed within a year or two, and that after these studies are completed priority should be given to a comprehensive community plan and regional studies of the economy, industrial development, population trends, land use, and transportation and community problems.

Cleveland's Mall Center

Cleveland's plans for a Mall Center redevelopment project are closer to realization with a pledge from the New York real estate firm of Webb & Knapp that the firm will post \$100,000 to establish its good faith and intention "to proceed with construction of at least a 30-story office building and

"SCORE HIGH" ELECTRICALLY



500-room hotel." The three conditions put on the agreement were: Cleveland voters must approve a \$15 million bond issue Nov. 5 so that the city can build a new convention hall north of City Hall; the City Council must approve the W & K plans; and at a later election voters must approve a 99-year lease on the lake front land where the new construction is to take place.

Build Island in Ocean As Oil Drilling Platform

Something new in oil drilling is being undertaken by Richfield Oil Corp. at its Rincon Island No. 1 project located approximately 3000 feet offshore from Punta Gorda, Calif., 14 miles south of Santa Barbara. Nearly everyone is familiar with off-shore angle drilling from the mainland to the tidelands or the drilling of oil from floating platforms, but the construction of an island platform from which tideland drilling operations are to be carried on is a departure from present methods.

This method of drilling was chosen to comply with lease requirements to develop offshore property from filled land. The particular site for the man-made island was selected in order to produce with



CONCRETE TETRAPOD CASTING YARD WITH INSET
PICTURE OF BULLDOZER UNLOADING ROCK FILL.

maximum efficiency from the subsurface oil structure. The island is to be a base from which Richfield plans to drill 68 oil wells into the tidelands.

The highest point on the island will be the west face, which will be 41 feet above mllw. North and south walls will be plus 24 feet, and the working area and wharf will be plus 16 feet.

LY WITH WESTINGHOUSE

WHY

Consulting Engineers
Look to Westinghouse
for Effective "Backup"

On the chart of specifying influences maintained at Westinghouse the consulting engineer is listed in bold type.

That is why Westinghouse engineering specialists, located in every key area, consider it an important responsibility to be available at all times as assistants on your team planning electrical systems. They *are* engineers and they *are* specialists. They have at their fingertips the most complete selection of electrical apparatus. Every item is of advanced design because of Westinghouse research and development.

Thus, these men can save you time, bother and money in helping to select exactly the right apparatus to assure each of your clients a co-ordinated system that will be economically adequate for maximum needs . . . today *and* in the future.

More and more consulting engineers are proving that by writing "specify **W**" on instructions handed to detailers, they enjoy the most positive form of client insurance. DP-5040-1

Here's an example of a "Specify **W**" system
and typical Westinghouse apparatus

YOU CAN BE SURE...IF IT'S Westinghouse



Before the project started, a primary test was made of the underwater area which involved drilling of test or core holes to evaluate subsurface structure. Many jet samples were taken to determine the type of material best suited as a foundation for the island structure.

Basic materials for construction of the island were taken from a hard sandstone quarry on Rincon Creek and trucked to the barge-loading wharf near Carpentaria. Quarry material is brought by barge to the island site and bulldozed over the side. Large rocks are placed by cranes. Rock is being placed at the rate of five barge-loads per 18-hour day.

Materials and stone sizes for the island are:

¶ 1100 cast concrete tetrapods, weighing approximately 31 tons each.

¶ 12,000 tons of quarry rock, weighing approximately 16 tons each.

¶ 33,000 tons of quarry rock, weighing approximately 6 tons each.

¶ 39,000 tons of quarry rock, weighing approximately 3 tons each.

¶ 108,000 tons open graded quarry run, up to 4 tons each in weight.

¶ 172,000 tons of dense graded quarry run.

¶ 124,000 cubic yards of sandy core fill.

The 1100 concrete tetrapods, each weighing 31 tons

and standing 11½ feet high, were cast in a plant set up by the contractor at the Carpentaria construction camp site. They will be used to line the seaward face of the island.

Beneath the island, pipes have been installed below the rock fill to carry oil to shore. Other pipes also have been laid which will lead to satellite islands that may be built in the future.

No piling is required for the island. However, some 50 bearing and fender pilings will be used to construct the wharf against which servicing vessels will be moored on the shoreward side. A causeway will extend 2618 feet to the shore at Punta Gorda.

The wharf area is to be constructed of a timber deck on precast, prestressed concrete piles. The total area will be approximately 4300 sq ft. It will be used primarily to service drilling and production operations with marine vessels.

All the drilling and other installations on the island will be conventional onshore type equipment with minor modifications for the cramped area involved. There will be no oil storage facility located on the island. However, there will be enough tankage to facilitate gaging, pumping, and dehydration operations.

John A. Blume and Associates, Engineers, are the design engineers and consultants on the project,

this planning team*

Scored high . . .

by SPECIFYING WESTINGHOUSE



Thousands of spectators will be thrilled by brilliant sports and pageantry in this beautiful new gym of the Alexander Memorial Physical Training Center at Georgia Institute of Technology in Atlanta. They will cheer athletes whose skills are at their peak, under light as "fast" as the games they play . . . with a high illumination level, free from glare or shadow.

Westinghouse lighting units are served by Westinghouse panels and control equipment, components of an all-Westinghouse electrical system. Read the details described on the following pages.

DP-5040-1

◀ Installation and wiring of the Westinghouse floodlights girding the circumference of the Alexander Memorial gym was simplified by the planning of this service balcony. It also provides convenient access for cleaning and lamp changes.

* Consulting Engineer — Charles F. Howe, Atlanta • Architect — Aeck & Associates, Atlanta • Electrical Contractor — Brooks Allison Co., Atlanta • Distributor — Electrical Wholesalers, Inc., Atlanta.

YOU CAN BE SURE...IF IT'S Westinghouse



with James M. Keith serving as resident engineer.

It is anticipated that the first phase of the island construction — rock placement and surfacing — will be completed in the first quarter of 1958. Drilling operations will start in the second quarter.

Alumina Production By-Product May Be Usable in Asphalt Paving

Jamaica red mud, now a worthless by-product of the aluminum production process, has shown promise as a substitute for cement and limestone in preparation of asphalt mixtures for highway surfacing in tests conducted at the Reynolds Metals Company laboratory and pilot plant at Hurricane Creek, Arkansas.

Mixing the by-product with asphalt would produce a road surface with a reddish tint, possibly reducing glare at night. The colored surface also could be used to indicate specific highway lanes or routes. The red mud might also be used to color cement and concrete products, and for production of paint pigments. It may become a source for specialty iron products, such as very pure electrolytic iron.

The mud is a by-product in production of alumina

(aluminum oxide), which is extracted from bauxite shipped from Jamaica. Metallic aluminum is made from the alumina.

The research work indicates a potential in agriculture for Arkansas brown mud, a waste material from bauxite mined in the state. Tests have indicated that it may become a substitute for the limestone now used by farmers for soil improvement.

ASHAE Lists Organizations Equipped for Heat Transfer Studies

The American Society of Heating and Air-Conditioning Engineers, realizing that studies and measurements of heat transmission through light transmitting materials under sun exposure require special laboratory facilities, surveyed a number of organizations to determine where this type of facility was available. The inquiry, by the Society's Technical Advisory Committee on Heat Transfer Through Fenestration, turned up at least 12 such organizations.

Those most interested in undertaking such studies are: Battelle Memorial Institute, Columbus, Ohio; Columbia University, New York, N.Y.; Duke University, Durham, N.C.; Cornell University, Ithaca,



N.Y.; University of Maryland, College Park, Md.; University of Michigan, Ann Arbor, Mich.; University of Minnesota, Minneapolis, Minn.; The Pennsylvania State University, University Park, Pa.; New York University, New York, N.Y.; Purdue University, West Lafayette, Ind.; Rensselaer Polytechnic Institute, Troy, N.Y.; and Southern Methodist University, Dallas, Texas.

ARBA Reports on Credit and Capacity Status of Highway Industry

Two major "task force" reports are being distributed by members of the American Road Builders Association. One is an evaluation of the credit problems of the highway industry and the other is an updating of two previous ARBA reports on capacity of major segments of the industry.

The credit report covers the fields of equipment manufacturers, producers of materials and services, distributors, contractors, financing and bonding companies, and state highway departments. Besides analyzing the problems and recommending corrective steps, the report draws the conclusion that "No major credit problems now exist nor are they expected to develop in the immediate future."

According to the capacity report, industry could support a highway construction volume double the current rate. Predictions for net contract construction for all roadbuilding are: 1957—\$4.2 billion; 1958—\$4.6 billion; 1959—\$5 billion.

In the 13 months since the start of the expanded interstate highway program, 58.6 miles of highway have been completed and 1928.8 miles advertised for contract or under contract but not yet completed, according to Federal Highway Administrator Tallamy. This does not include work on interstate roads prior to passage of the 1956 Federal-Aid Highway Act.

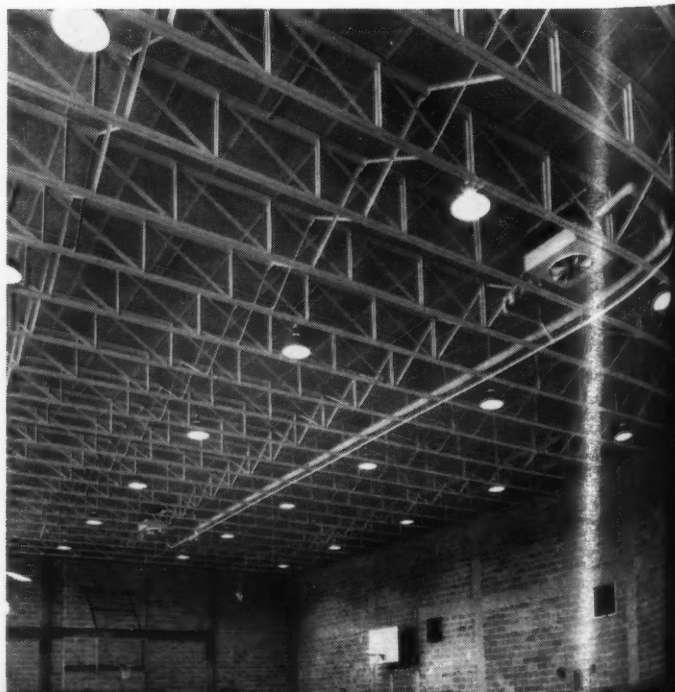
Services Outlined for Bureau of Public Roads Computer Library

The Users' Subcommittee on Highway Design was formed this spring to interchange information and programs pertaining to use of the Bendix G-15 computer. At its third meeting, held in Los Angeles, the group discussed participation in the library of electronic computer programs on highway design to be established by the Bureau of Public Roads.

L. R. Schureman, Bureau of Public Roads, in his report on the status of the library, stated that the

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Bureau recognizes various levels of interest in a project: the entire civil engineering profession, the Bendix Users' Subcommittee, and users of computers manufactured by other firms. To date, 23 states, Puerto Rico, and Hawaii have indicated that they will support the project.

Also at the meeting, Vogt, Ivers, Seaman and Associates, of Cincinnati, distributed three programs: spiral coordinates, reinforcing steel tabulation, and pier design. A five-step program for bridge geometrics also was outlined by the company. Dr. Jerry C. L. Chang, chairman of the Users' Subcommittee, and a member of the consulting firm of Richardson, Gordon and Associates, presented a report from his firm on "Influence Line for Continuous Beam Design and Analysis of Rectangular Reinforced Concrete Columns."



SAN DIEGO NAVAL OFFICIALS DISCUSS PLANS WITH THEIR CONSULTANT. L. TO R., CAPT. RALPH C. MACDONALD, CAPT. A. D. HUNTER, M. A. NISHKIAN.

Naval Air Station to Have Underground Fuel Storage Facility

An underground aviation and jet fuel storage facility to be built at the Naval Air Station, North Island, San Diego, Calif., will have a total capacity of 4 million gallons. It will include 19 steel tanks and six prestressed concrete tanks. In addition, a

20,000-ft distribution system will serve aircraft carrier moorings with aviation gasoline and jet fuel. M. A. Nishkian, Long Beach, Calif., is consulting engineer on the project.

Incoming fuel barges will be unloaded at T-shaped concrete piers where electric motor driven pumps will transfer the different fuels through 6000 feet of pipeline into the storage area.

ALL WITH WESTINGHOUSE

Functional Lighting . . . SPECIFY WESTINGHOUSE



There is a Westinghouse fixture for every lighting requirement. In the Alexander Memorial are examples of Westinghouse functional beauty and economy with efficient, lighting levels . . . all in harmony with the architectural décor.

At far left, recessed troffer units blend with unusual ceiling patterns in a radio sound studio; center, a gymnasium in the Memorial Building where Westinghouse high-bay units provide high-level, economical illumination; and the office scene demonstrates one application of Westinghouse LC fluorescent units for efficient, attractive lighting.

Ask your Westinghouse lighting specialist about complete Westinghouse line; in particular, the spectacular new Carousel units, available in two colors: sea-foam green and sun-tan brown.

DP-5040-3

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Westinghouse



The dual-purpose pumping station, which is also to be used for refueling aircraft carriers and other vessels, will be equipped with an emergency standby diesel-driven generator plant as a protection against incoming power failure.

Weight of Gymnasium Carried on Reinforced Concrete Piers

The site selected for Tennyson High School of South Hayward, Calif., provided an interesting foundation problem for structural engineer Thomas F. Chace, and for soils and foundation engineers Woodward, Clyde & Associates. Construction of the three million dollar project, now underway, should be completed by the 1958 fall term.

There is engineered fill under the entire building area and supporting all structures except one, the gymnasium. This building, located in the heart of the "play core" contributes the heaviest loads in the area with the greatest height of fill. Thus, the design solution was to support the floor slab for the gymnasium on the engineered fill but carry all structural loads on reinforced concrete piers down through the fill. Some of these piers extend down as far as 13 feet.

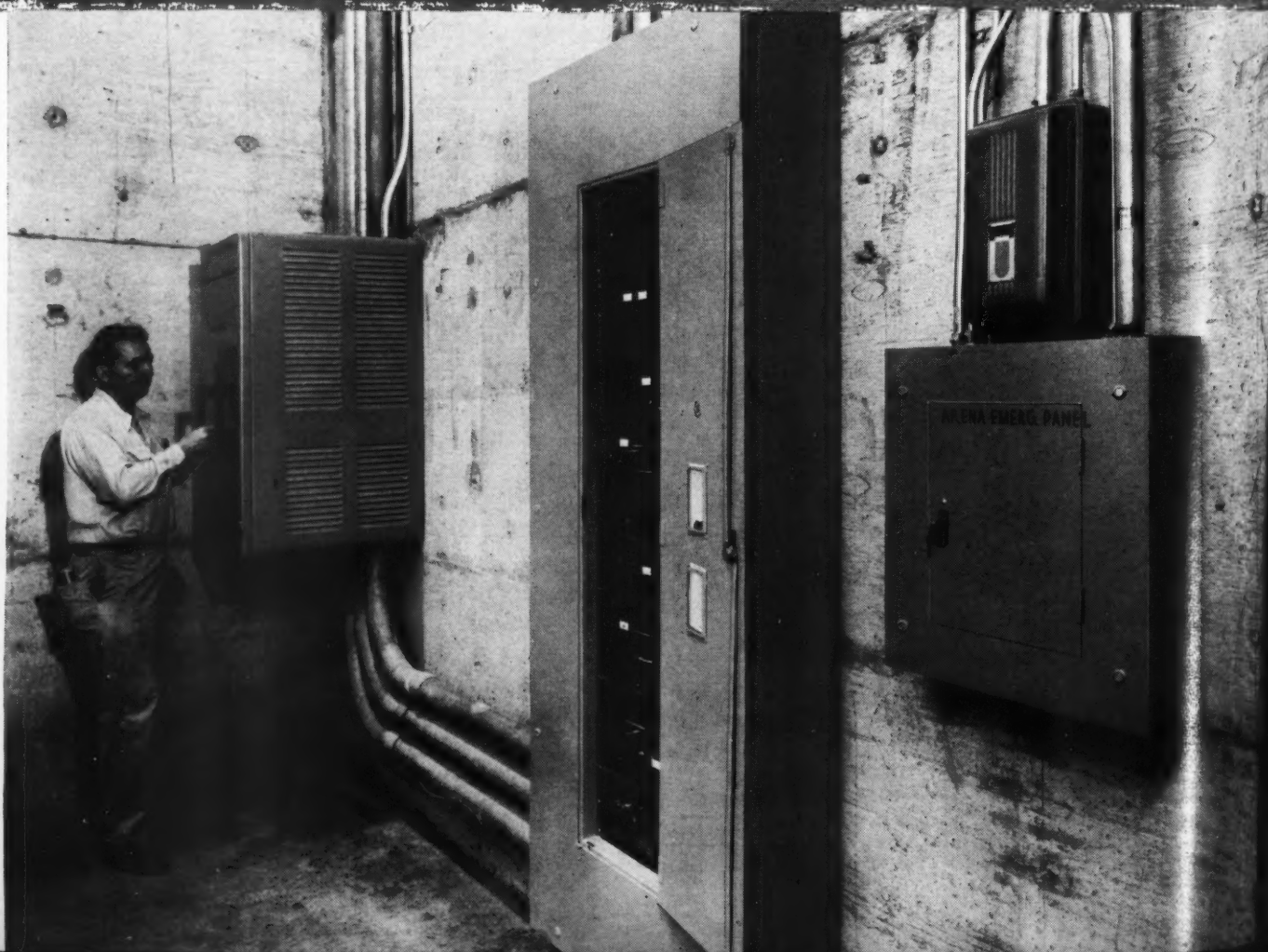
The 152,000-sq ft school, accommodating 1800 students, is of wood frame construction, except for the gymnasium which is concrete and steel. The nine separate buildings in the design include the gymnasium, shop, cafeteria-theatre-music building, administration building, and five distinctive classroom structures. Adjacent to the classrooms will be a central court for school rallies, meetings, and other student activities.

Changes in City Plumbing Code Under Fire in New Orleans

Presentation of proposed changes in the New Orleans city plumbing code has been postponed by the City Sewerage and Water Board's plumbing conference committee after objections were raised by A. R. Salzer, Jr., mechanical engineer, representing the Greater New Orleans Code Committee. Salzer charged that the committee was making requirements for fixtures to be installed which were unwanted, unnecessary, and costly, and that existing sections of the city plumbing code on this subject had not been enforced.

Committee chairman Neill Jeffrey, Jr. pointed out that the proposed changes were "simply com-

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plying with the State Board of Health's sanitary code which provides statewide minimums and no local authority can adopt rules for less than the state code calls for."

Jeffrey further said that the proposed changes originally came before the committee at Salzer's request and were being recommended for adoption by the committee after exhaustive investigation which included comparison with other cities throughout the country.

"Most of the specific points which Salzer dislikes about the proposed changes are apparently the result of his lack of information on what changes are proposed or his misinterpretation of the changes," Jeffrey said. "Several objections to the minimum requirements provided in the state code were developed during the plumbing conference committee's investigation and a request for amendment of these points is being forwarded to the state board of health."

The committee was of the opinion that changes to the New Orleans code will actually reduce the requirements of the present code, reduce construction cost, and provide the architect, mechanical engineer, and plumbing contractor with the detailed information needed in planning or installing a plumbing system in the city of New Orleans.

Asphalt-Neoprene Surfacing Under Test on Rural Roads

Highway engineers in five states are cooperating with Du Pont rubber chemists in testing asphalt containing neoprene synthetic rubber as an improved material for surface treated roads. If these field tests substantiate seven years of laboratory investigations, neoprene may lengthen substantially the life of the road surface and at the same time provide safer driving conditions and cut maintenance costs.

The synthetic rubber is mixed in specific proportions with standard asphalt, and the surface material is applied with conventional equipment. The test material is laid side-by-side with untreated asphalt so surfaces will be exposed to identical wear.

It is expected that neoprene will add elasticity to the asphalt, holding the stone chips in place longer. In addition to longer life, this will provide better traction.

Since most secondary roads are of the surface treated type, Du Pont requested typical rural roads for test sites. Roads are selected with curves, numerous rises, dips, and grades so that traffic can test the material under various conditions.

Photographs are taken when the surface is ap-

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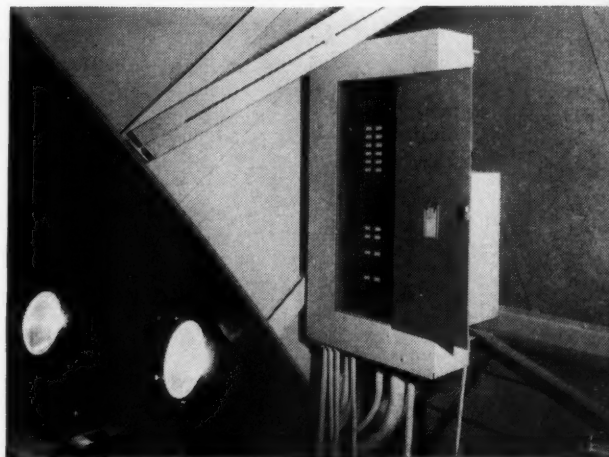
For Panelboards With Reliable Service Protection... SPECIFY WESTINGHOUSE

The coordinated Westinghouse power distribution system in the Alexander Memorial insures protection of electrical services and provides for reliable power. Nerve centers of the system are the Westinghouse distribution and lighting panelboards. Their inherent ability to instantaneously stop power on dangerous short circuits—yet allow harmless overloads to pass through—provides the maximum in power continuity, reliability and protection.

DP-5040-4

→
This Westinghouse Type NLAB lighting panelboard controls all of the balcony and overhead floodlights for the Alexander Memorial gym.

←
The power panel and emergency lighting panel shown here are part of the building's positive system protection through Westinghouse circuit breaker panelboards.



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plied. A highway engineer-rubber chemist team then inspects the condition of the strips at regular intervals and during unusual climatic conditions. At spots where unusual wear is expected, special patches are marked, and a series of close-up photographs will record how the material stands up. Usually these spots are selected on sharp curves, at the crown of rises, or in the center of dips in the road.

Test strips have been laid in Pennsylvania, Michigan, New Jersey, Delaware, and Oklahoma. Plans are being made to lay strips in Colorado, California, and several other states.

Pavement Skid Resistance Measured By New Machine

A new skid machine developed by University of Tennessee engineers will be put to work soon for the State highway research program being conducted at the University.

It consists of a motor-powered single automobile tire that spins on the sample under test to determine how long the sample retains its skid-resistant properties. The machine is expected to give highway engineers a short-cut answer to the question of which concrete and asphalt pavements have the

longest lasting skid resistance. Special instruments in the machine will record surface friction.

By next June engineers working on the project expect to have completed tests on various types of concrete pavements and then will undertake work on asphalt coatings.

High Temperature Hot Water Heating Designed for Marine Corps Base

Plans and specifications for a high temperature, central hot water plant and distribution system to serve Camp Margarita have been approved by Captain A. D. Hunter, district public works officer of the 11th Naval District. This is a permanent field training area within Camp Pendleton, the big Marine Corps Base between Los Angeles and San Diego just north of Oceanside, Calif. M. A. Nishkian and Co., Long Beach, Calif., are consulting engineers.

The plant will have concrete block masonry walls with metal sash and louvers, and a roof supported by a reinforced concrete beam and column system.

A high bay section of the building will house the high temperature water generating equipment while auxiliary switching gear and offices will be located in a low-roofed area of the building. Hot water gen-

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For larger power requirements, Westinghouse switchgear, unit-built from standard component, simplifies installation, provides safe, sure control of distribution for any type of electrical system.

erators, of the forced circulation type with an individual unit circulation pump, will have air-tight steel jackets to permit the use of forced draft fans, air puff soot blowers, and burners equipped for either gas or oil.

The plant will be equipped with a completely automatic combustion control system, sensitive to fluctuating pressures and temperatures, automatically compensating to maintain proper proportioning of the fuel and combustion air ratio in order to give maximum operating efficiency under varying local weather and load conditions.

Distribution of the high temperature water will be by means of an underground supply and return pipe system.

News of Consulting Engineers Council

Consulting Engineers Council has plans underway to incorporate in the state of Louisiana as a result of the passage in the state of a modern Corporate Law that allows a corporation to register in Louisiana and still have its offices anywhere in the United States. All that is necessary is an office of registry in the state. However, before incorporating, certain changes in CEC's constitution will be necessary.

The Executive Committee has approved, subject to confirmation of the Board of Directors, change-over of group Errors and Omissions Insurance from Lloyds of London to the Fidelity and Casualty Co., a member of the American Fore Group, under the sponsorship of H. C. Hauth Co., Inc., New York.

The fall Board of Directors meeting of the Council is scheduled for Nov. 15-17 at Springfield, Ill.

High Level Bridge Favored for Baltimore County

A plan for the construction of a \$4,000,000 toll bridge across Bear Creek is being considered by the Baltimore County, Md., Revenue Authority. The contemplated bridge would be erected between the mainland and Sparrows Point, near the existing Baltimore and Ohio Railroad bridge.

Wilson T. Ballard Co., Consulting Engineers, proposed that either a draw bridge and grade separation or a high-level bridge be erected. Preference was given to the high-level bridge, which was estimated to cost \$3,986,500, including grade separation and highway improvements.

A proposed Peninsula expressway from Stansbury Lane to the bridge would cost \$2,189,000.

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Modern industrial planning calls for both flexibility and economy in power distribution.

These qualities are inherent in Westinghouse Life-line® bus-way design . . . with conventional bus duct or new Uni-bus. Most flexible of all bus distribution is Westinghouse Uni-bus, which does away with problems of close fitting, turns and troublesome obstacles.

Another outstanding advantage of Uni-bus is its inherent safety. Plug-in, power take-off devices can be completely installed and wired *before* live connections are made.

Ask your Westinghouse construction sales engineer for more information about flexible, economical, safe, Westinghouse bus-way systems.

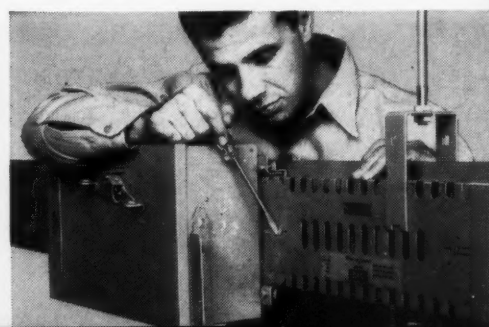
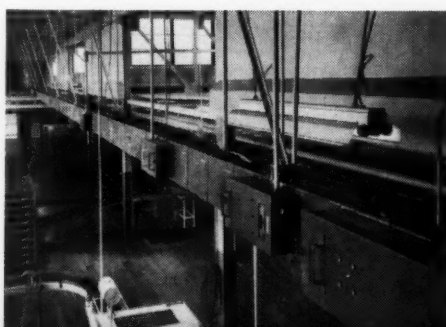
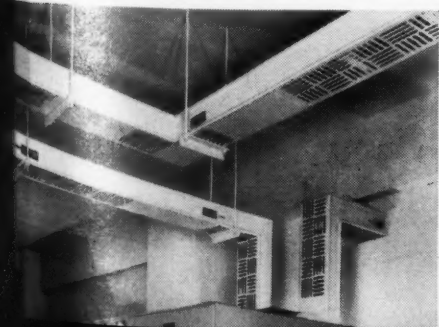
DP-5040-5

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Left: Typical installation of low-impedance bus duct. Center: Conventional plug-in bus duct with power take-off receptacles spaced every 12 inches for convenient power use. Right: New

Uni-bus makes every job fit without difficulty. Wiremen are protected by safety interlock that keeps live bus covered until plug-in wiring is complete.



Other estimated costs in connection with the high-level bridge include \$422,500 for the grade separation structure over the railroad tracks and \$22,000 for the Peninsula expressway from Merritt Blvd. to the departure from Salisbury Lane.

Total cost of an alternative drawbridge, grade separation, and highway approaches was estimated by the consultants at \$4,425,500.

Study Produces Graphs Used to Forecast Storm Surges

A study of storm surges, begun shortly after a freak Lake Michigan wave cost ten lives in Chicago, in 1954, will continue without further funds from the original sponsor, the Engineering Foundation.

The continuing research is made possible by careful budgeting and the contribution of gratuitous services by the Lamont Geological Observatory, Columbia University; the U. S. Lake Survey and Weather Bureau; and Columbia University (which waived a fairly substantial overhead).

Dr. William Donn, project director, announced that as a result of the studies so far, damaging storm tides along the eastern seaboard can be forecast on an empirical basis. Graphs prepared for this pur-

pose show a useful relationship between wind velocity and storm tides.

The initial studies of storm surges (waves of meteorological origin) were confined to Lake Michigan, but the conclusions were confirmed through a study of Lakes Huron and Erie. It was found that it was an unusually high wind velocity combined with an atmospheric disturbance over Lake Michigan that was responsible for the disastrous Chicago wave.

Dr. Donn is a member of the International Geophysical Year oceanographic study program. The IGY group is using long-wave recorders to study storm surges in lakes.

New Microwave Relay System for 1960

Installation of a new microwave relay system to carry cross-country telephone, radio, and television signals will begin in the latter part of 1959, according to M. B. McDavitt, of the Bell Telephone Laboratories. In a paper presented to the American Institute of Electrical Engineers Fall General Meeting, he noted that the present system will be fully loaded by 1960. The new system is being designed to transmit signals over 4000 miles. ▲▲

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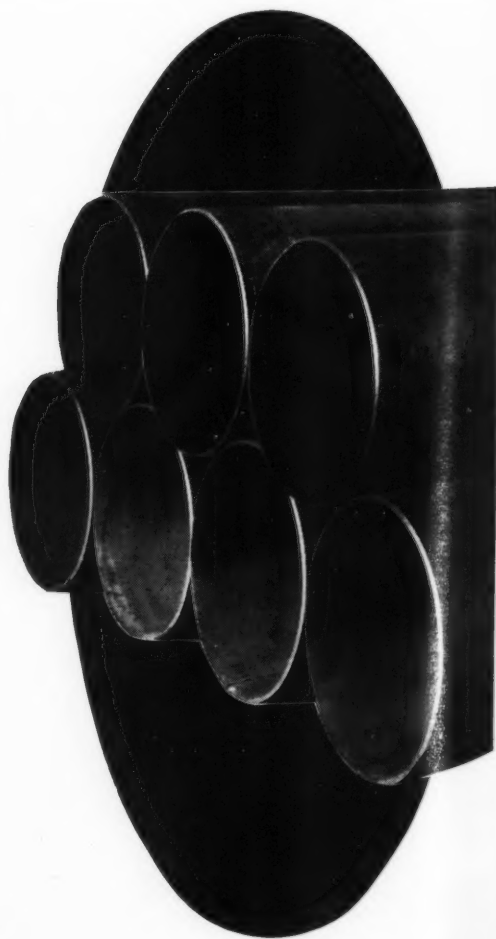
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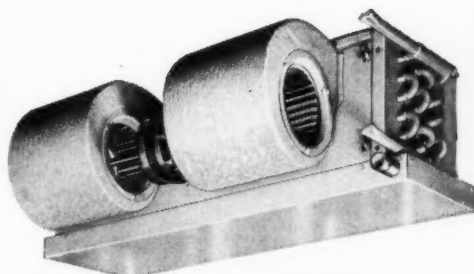
IBM's Handsome Washington Offices Comfort Conditioned By *Marlo*

At IBM's handsome offices in Washington, D. C., comfort never takes a holiday, with Marlo equipment on duty around the calendar.

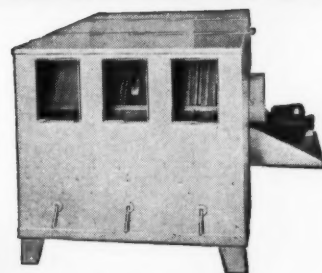
Summer cooling and winter heating in this modern structure are provided by three types of Marlo equipment: three multi-zone air conditioners, the versatile units that can perform several different conditioning functions simultaneously; a remote room unit, horizontal recessed style; and an evaporative condenser.

Mechanical contractor on the project was John C. Grimberg Company. Architect was John Hans Graham & Associates, general contractor was Blake Construction Company, and mechanical engineer was Shefferman & Luchenburg.

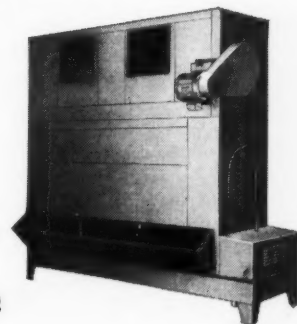
Write today for complete information on the Marlo quality line of air conditioning and heat transfer equipment.



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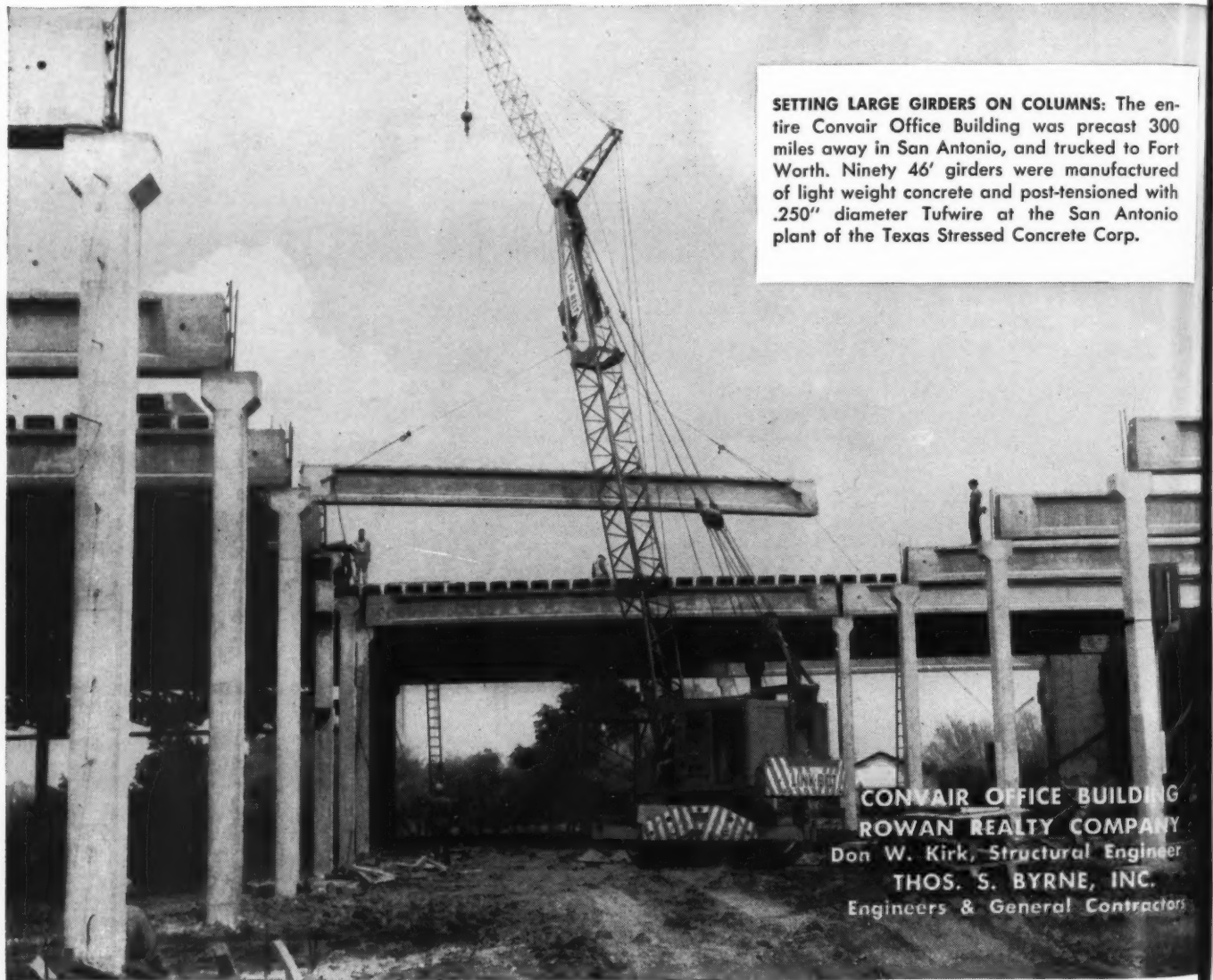
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MARLO coil co.

SAINT LOUIS 10, MISSOURI

Quality Air Conditioning and Heat Transfer Equipment Since 1925

Prestressed Concrete Building



SETTING LARGE GIRDERS ON COLUMNS: The entire Convair Office Building was precast 300 miles away in San Antonio, and trucked to Fort Worth. Ninety 46' girders were manufactured of light weight concrete and post-tensioned with .250" diameter Tufwire at the San Antonio plant of the Texas Stressed Concrete Corp.

CONVAIR OFFICE BUILDING
ROWAN REALTY COMPANY
Don W. Kirk, Structural Engineer
THOS. S. BYRNE, INC.
Engineers & General Contractors

Products Manufacture and Erection: Texas Stressed Concrete Corporation, San Antonio, Texas

Completed in 4 Months — Despite Record Rains

The rains came. For 22 days the construction business in Fort Worth, Texas, slogged through a deluge that meant delays ranging from slow-downs to shut-downs. You can't pour concrete in the rain.

In the midst of this, an outstanding advantage of prestressed concrete construction was dramatically demonstrated — speed of erection even under adverse conditions.

The 102,000 sq. ft. Convair office building and warehouse is the case in point. The prestressed concrete structural members were erected in 13 working days — rain or no rain. The building was complete—offices, air-conditioning and all—in less than four months.

Speed of erecting is only one of many advantages that make prestressed concrete the miracle building ma-

terial. Others are: great strength-to-weight ratio; less concrete needed; greater recovery after overloads; thinner sections; on schedule transportability of prestressed members; longer spans; permanence of concrete PLUS amazing flexibility and elimination of cracking; adaptability as unlimited as the imaginations of architects and engineers. Today, prestressed concrete is being used in a range of applications from fence posts to giant bridges and multi-story buildings; from movable parking lot curbs to airport runways.

Advances in the development of better high tensile strand and wire by Union Wire Rope Corporation have contributed heavily to the booming trend to prestressed construction. Once the problem of dependable tensioning materials was whipped, the way was opened wide for the "new age of concrete."

Erected In Only 13 Days

How Will You Share in Vast New Markets Opening For Prestressed Concrete Makers?

Looking for a new route of expansion? Want to get in on an industry that's expanding at a tremendous pace every year, with a future of fantastic dimensions? Prestressing offers opportunities not only to the on-site contractor, but also to the contractor who would like to operate a permanent casting yard as an arm of his business or as a commercial fabricator. Here are some of the opportunities:

OPPORTUNITIES in Buildings: Structures of just about every description are being built better with prestressed concrete. Office buildings, garages, warehouses, schools, motels, hospitals. Now the walls of multi-storied buildings are being poured in big slabs with openings for doors and windows, then tilted up to position. Floors are poured in "layers" separated by greased paper, then raised to upper floor levels.

OPPORTUNITIES in Bridges: The tremendous National Highway Program now under way calls for 300,000 bridges, most of which can be built much faster and more economically with prestressed concrete than with any competitive building material. Other bridges ranging from a small

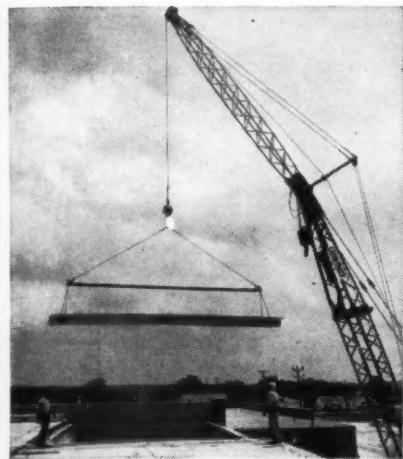
creek crossing to the world's longest highway bridge are built of prestressed concrete.

OPPORTUNITIES in Highways: Prestressed concrete pavement is already in the advanced experimental stage. The slabs need be only 5 inches thick, as contrasted with the ordinary 10-inch slabs used on many highways. They promise high levels of strength and permanence, speed of construction, savings in time and money. And more profit for suppliers and contractors.

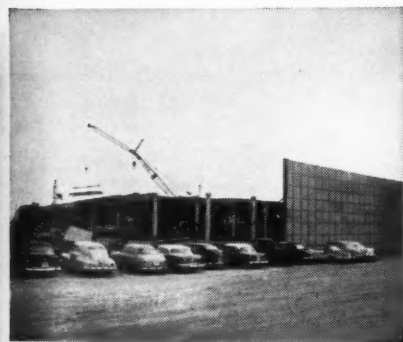
These are just a few of the many uses where concrete prestressed with Union Tufwire strand and wire is proving its structural and economic advantages. Almost anything that concrete will do—it will do better when prestressed with Union Tufwire.

If you're a present user of prestressed concrete, or engaged in making it, let our engineering department and research laboratory give you and your consulting engineers a lift with any prestressing project.

If you're among those who see the big opportunity for a new plant to supply your area, let us help you explore the possibilities.



CLOSE-UP OF DOUBLE TEE BEING SET: Tuffy Slings were used as shown in placing 920 of these 4' double tee slabs. Slabs were made from lightweight concrete using Union Wire Rope "Tufwire" strand.

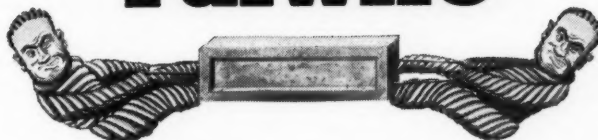


BUILDING ALMOST CLOSED IN: Work progresses steadily in the dreary rain as another double tee is hoisted into position. The roof structure was designed for parking. It was given a thick asphalt wearing surface.



LAST OF THE DOUBLE TEES ARE HOISTED FROM TRUCK completing roof for asphalt surface.

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New Projects Reported

By Consulting Engineers—

CALIFORNIA

John Graham and Company
Seattle, Washington.
College Grove, San Diego, Calif. Regional shopping center located on east side of city. 883,000-sq-ft rentable store area with parking for 6200 automobiles. \$16,000,000 (store area only). Client, College Grove Associates.

Holmes & Narver, Inc.
Los Angeles, California.
Design and engineer publications building and flight simulation center \$2,233,000. Client, Douglas Aircraft Co.

W. H. Hermes III, P.E.
San Diego, California.
Three-story 2-block long courthouse, 7-story office building, and 8-story

jail. Complete mechanical engineering. 600 tons air conditioning for courthouse and sheriff. Office building heating and ventilating only with provision for future air conditioning. (mech.) \$2,000,000 (mech. only) Client, Joint venture with G. W. Dunn, P.E., Associated Architects & Engineers, for courthouse facility for County of San Diego.

Horton Elementary School, San Diego. 18 classrooms, administration building, cafeteria, auditorium. Plumbing, heating, and ventilating. (mech.) \$385,000 (total) \$60,000 (mech. only). Client, George Lykos.

J. Paul Jones Elementary School. 12 classrooms, administration building, cafeteria, auditorium. (mech.) \$300,000 (total) \$51,000 (mech. only) Client, George Lykos, A.I.A.

Riverview Elementary School. 10 classrooms, San Diego County. (mech.) \$32,000 (mech. only) Client, George Lykos, A.I.A.

Escondido High School additions. (mech.) \$1,500,000 (total).

Ramona Elementary School. 24 classrooms, administration building, cafeteria, auditorium. Well, septic tanks. (mech.) \$500,000.

Roosevelt Junior High School, San Diego. 32-classroom addition. (mech.) \$600,000.

COLORADO

Tracy-Behrent Engineering Company
Denver, Colorado.

Seven-story research building for National Jewish Hospital, Denver, Colo. (mech., elec.) \$1,000,000. Client, Eugene D. Sternberg, Arch.

Summit House, Top of Pike's Peak, Colo. (elec.) \$500,000. Client, Edwin A. Francis & Carlisle B. Guy, Associated Architects.

DELAWARE

Daniel Koffler, P.E.

New Castle, Delaware.
Iron Workers Union Building, Local 451, Wilmington, Del. 2-story steel frame with long span steel joists, metal roof deck, and lightweight metal and concrete intermediate levels. (civil, struc., mech.) \$65,000. Client, Howard Greenhouse and Assoc., A.I.A.

Olympic size swimming pool, 42 x 90 feet and separate children's wading pool. Reinforced concrete with above grade pump house and men's and women's locker rooms and showers. (struc., civil, mech.) \$30,000. Client, same as above.

LOUISIANA

J. S. Boyd and Associates
Shreveport, Louisiana.

Sarepta, La., municipal water distribution system, well, elevated tank, and fire protection. (civil) \$125,000. Client, Mayor J. Richard Griffin, Sarepta, La.

Demopoulos & Ferguson
Shreveport, Louisiana.

Hearne Avenue street improvement and underpass. (civil) \$550,000. Client, City of Shreveport.

MARYLAND

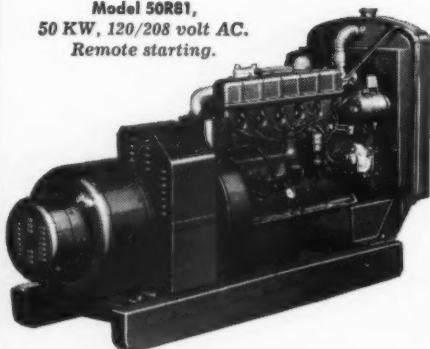
Penniman & Browne, Inc.
Baltimore, Maryland.

Subsurface exploration for bridge at Padonia Road and Pennsylvania Railroad, Baltimore County, Md.

KOHLER ELECTRIC PLANTS

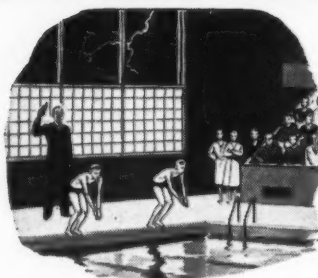
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vital safeguard for
schools, hospitals, public
and commercial buildings**

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Remote starting.



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Sudden darkness in a school swimming pool may cause panic and disaster—when central station power is cut off by a storm or accident. Kohler stand-by electric plants take over critical loads automatically, wherever and whenever needed.

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An international program is under way by AMCA. It will provide you as rapidly as possible with a means of identifying those types of air moving equipment qualifying under the program.

As a protection to you, practically all leading manufacturers of air moving equipment are planning to qualify their standard products in tests made in accordance with the AMCA Standard Test Code and in laboratories inspected and approved by AMCA.

Each qualifying company will operate under a license agreement with AMCA basically requiring the following:

1. The manufacturer's laboratory must be approved by AMCA.
2. Qualifying equipment must be tested in accordance with the AMCA Standard Test Code and published ratings must be in accordance with such tests.
3. The manufacturer must maintain manufacturing control of the products involved so that the equipment will perform in accordance with published ratings.

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2159 Guardian Bldg.
Detroit 26, Mich.

Please let me have details on the AMCA Program for rating of air moving equipment.

NAME _____

COMPANY _____

ADDRESS _____

CITY & STATE _____



Blueprint of Chicagoland Economic Opportunities

What industrial plant sites are available in Chicago and Chicago Heights? Where are they located in respect to transportation, shipping and other facilities? What materials are plentiful? What is the labor situation? What about housing—and schools?

This new book, "Chicago & Chicago Heights Industrial Economic Blueprint," has been published to answer these questions and many more. With maps, diagrams, charts, photographs and text, it gives you a detailed analysis of the area and its physical characteristics. Here are easy-to-grasp facts about population, labor force, raw materials, transportation, utility and business services. The significant figures covering some eighty-service classifications of manufacturing industries are tabulated for quick reference.

"The amount of detail work that went into the preparation of these reports is truly amazing. In all the years in which we have been engaged in plant location work we have never seen so much data collected on a particular area."—from a letter describing previous economic studies by Chicago & Eastern Illinois Railroad.

Available without charge. For a complimentary copy of "Chicago & Chicago Heights Industrial Economic Blueprint," write Mr. H. Sampson, Vice-President, Chicago & Eastern Illinois Railroad, 332 South Michigan Avenue, Chicago 4, Illinois.



Chicago & Eastern Illinois Railroad

(civil) Client, Baltimore County, Office of Central Services and Wilson T. Ballard Co.

MICHIGAN

Harold N. Davidson
Kalamazoo, Michigan.
Structural design, new postoffice, Kalamazoo, Mich. Partial structural steel, partial flat plate, masonry and glass exterior. \$1,400,000. Client, Stapert, Pratt, Bulthuis, Sprau & Crothers, Arch.

Eberle M. Smith Associates, Inc.
Detroit, Michigan.
Northville High School. (arch., civil, struc., mech., elec.) \$1,800,000. Client, Northville Board of Education, Mich.

Kalamazoo S. E. Junior High School. (arch., civil, struc., mech., elec.) \$1,400,000. Client, Kalamazoo Board of Education.

Lincoln Park High School addition. (arch., civil, struc., mech., elec.) \$5,000,000. Client, Lincoln Park Board of Education.

St. Joseph High School. (arch., civil, struc., mech., elec.) \$2,700,000. Client, St. Joseph Board of Education, Mich.

Flint High School. (arch., civil, struc., mech., elec.) \$3,000,000. Client, Flint Board of Education.

Ecorse Junior High School. (arch., civil, struc., mech., elec.) \$1,500,000. Client, Ecorse School District No. 8.

MISSOURI

Donald Ross & Associates
Clayton, Missouri.
Mobile radio communications survey, St. Louis County, Mo. (elec.) \$20,000. Client, St. Louis County.

Office building, St. Louis County, Mo. (elec.) \$500,000. Client, Meyer Loomstein, Arch.

Instrumentation and automation program, St. Louis, Mo. (mech., elec.) Client, Moloney Electric Co.

NEW YORK

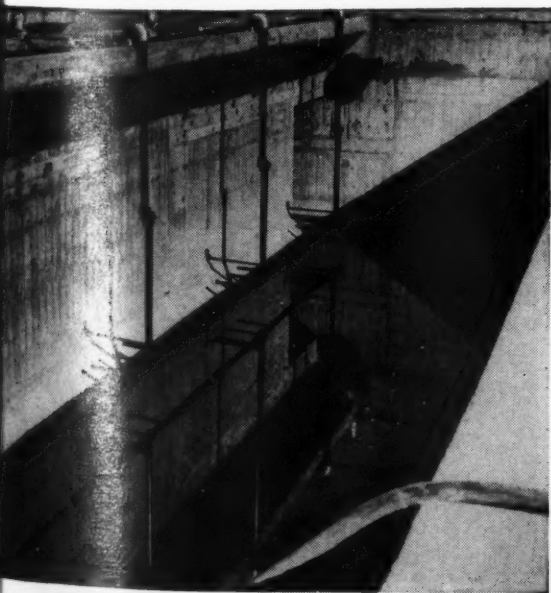
Lev Zetlin, Consulting Engineer.
New York, New York.
Utica Municipal Auditorium, Utica, N.Y., featuring prestressed cable roof. (struc.) \$3,000,000. Client, City of Utica, N.Y., Gehron & Seltzer.
Munson-Williams-Proctor Art Gallery and auditorium, Utica, N.Y. Exposed concrete walls, balconies suspended from prestressed concrete lattice (two-way girders). (struc.) \$2,000,000. Client, Munson-Williams-

CONSULTING ENGINEER



The Columbus, Ohio, Sewage Treatment Plant relies on wrought iron pipe's protective properties in tough, corrosive service

21-year service record provides good reference for this Wrought Iron Pipe railing job



View of wrought iron air diffuser piping
in Columbus, Ohio's Sewage
Treatment Plant

Wrought iron served so well, so long in corrosive atmosphere surrounding the Columbus, Ohio, Sewage Treatment Plant, that engineers selected this material again for use in the plant's new \$2,500,000 addition.

On the job in the original plant since 1935, wrought iron was used for all pipe services two inches and under. In the new addition, 90% of the wrought iron used was for guard railings, 1½ inches in diameter. The remainder of wrought iron tonnage on this installation went into gas lines and miscellaneous piping, including the grease ejector mechanism vault and the air diffuser piping.

We can prove to you how wrought iron outperforms other materials in a variety of applications. Our bulletin—*Wrought Iron for Sewage Treatment and Disposal Installations*—contains the evidence. Write for your copy.

A. M. Byers Company, Pittsburgh, Pa., Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

Available in Canada and throughout the world

City of Columbus Sewage Treatment Plant Addition

Engineers: Uhlmann & Associates

Contractors: George S. Sheaf & Co., Inc., and E. P. Coady & Co. (A Joint Venture)

Fabricator: Columbus Metalcraft Co.

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS



"He Has Nine Lives"

..but for long collector life

THE **AEROTEC** NEW 5 RWS

Aerotec's latest development in the field of erosion resistant dust collector tubes is unique.

Aerotec engineers proved, by accelerated tests under erosive conditions many times greater than normally encountered, that of all metals tested, white cast iron assures maximum resistance to abrasion.

These tests are substantiated by actual installations. They now establish the Aerotec 5 RWS collector with white iron tubes as the ultimate in long life and sustained high efficiency in the field of mechanical collection.

If your dust collection problem requires top mechanical efficiency, discover the assurance of highest performance and long life possible only with an Aerotec 5 RWS. Call or write our Project Engineers today. They are ready to help you solve your dust control problem.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in 38 principal cities)

Canadian Affiliates: T. C. CHOWN, LTD., 1440 S. Catherine St. W., Montreal, Que.

Manufacturers

THE AEROTEC CORPORATION

Greenwich, Conn.

Proctor Institute, Philip Johnson.

Harold Becher Co.,
Automation Engineer.

New York, New York.

Design and supervise construction of tools, jigs, and fixtures. (mech.) \$35,000. Client, Otis Elevator Co.

Ebasco Services, Inc.

New York, New York.

Consultation at state institution on failure of boilers to generate rated steam capacity.

Engineering consultation on preparation of specifications for communications system.

Engineering services in development of long-range distribution plan including method of tabulating existing loads by areas.

Engineering services in study on economics of use of electromobile power units for new capacity requirements of utility system.

Robert Floyd.

Geneva, New York.

Victor Central School addition, Victor, N.Y. (civil, mech.) \$400,000. Client, White & Helm, Arch.

New elementary school, Manchester, N.Y. (civil) \$1,100,000. Client, White & Helm, Arch.

Veterinary hospital, Gilmour & Buell. (civil, mech.) \$70,000. Client, White & Helm, Arch.

Slocum & Fuller.

New York, New York.

Headquarters, Data Processing Division IBM, Armonk, N.Y. (mech., elec.) \$5,500,000. Client, Skidmore, Owings & Merrill.

New facilities, Pier K, Brooklyn Navy Yard, N.Y. (struc., mech., elec.) \$1,200,000. Client, U.S. Navy.

State Teachers College, Oswego, N.Y. (mech., elec.) \$3,000,000. Client, Kelly & Patterson.

Junior High School #136, New York City. (mech., elec.) \$3,600,000. Client, York & Sawyer.

First Presbyterian Church House, New York City. (mech., elec.) \$800,000. Client, Edgar Tafel.

Parsons, Brinckerhoff,
Hall & Macdonald.

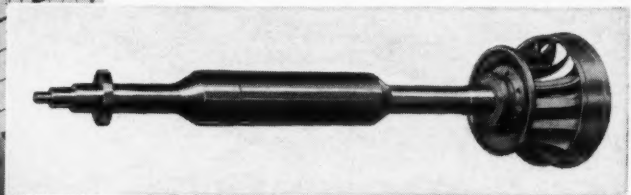
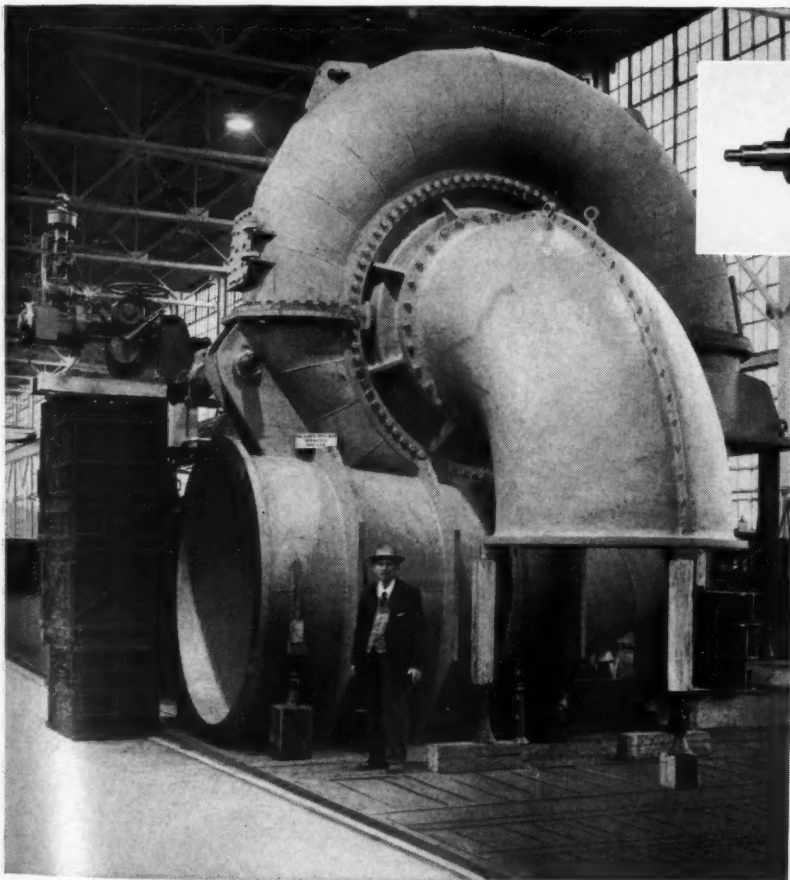
New York, New York.

Albany arterial crosstown route, Albany, N.Y. Field surveys and preparation of preliminary designs, final plans, specifications, and right-of-way maps for 1.7-mile long section. Client, New York State Department of Public Works.

CONSULTING ENGINEER

LEFFEL BUILDS GIANT HORIZONTAL TURBINE FOR PLEASANT VALLEY.

The low net head of 68 ft. at the Pleasant Valley Power Plant near Los Angeles required the design and construction by Leffel of a giant, horizontal spiral case turbine unit. This turbine, rated to develop 3,520 H.P. under the net head of 68 ft. at a speed of 257 R.P.M., drives a horizontal generator. A common shaft carries both the generator rotor and the stainless steel runner. A synchronous by-pass valve allows adjustment of flow for both turbine and by-pass discharge to meet water passage requirements. Photographs here show this giant turbine in various stages of production at the modern Leffel plant.



Leffel has the technical know-how and modern plant facilities to design and construct efficient, economical, rugged turbines of most types and capacities. And Leffel provides fast, complete service. Field engineers are available to assist you in the original planning of your project, and to help you with the actual installation of your turbine.

If you're planning a new project, or the rehabilitation or expansion of old facilities, and you want fast, complete service, contact Leffel, producers of top performing turbines. Mail the coupon below, today, for complete information.

**LEFFEL HELPS YOU PRODUCE MORE
POWER FOR PROGRESS**

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THE JAMES LEFFEL & CO.



FOUNDED IN 1862

**MORE EFFICIENT HYDRAULIC
POWER FOR 95 YEARS**

FREE LITERATURE

THE JAMES LEFFEL & COMPANY
Dept. E, SPRINGFIELD, OHIO

☐ Please send me more information on Leffel hydraulic turbines.

☐ Please have your representative call.

Name _____ Title _____

Company _____

Street _____ City _____ State _____

A NEW WARREN Centrifugal



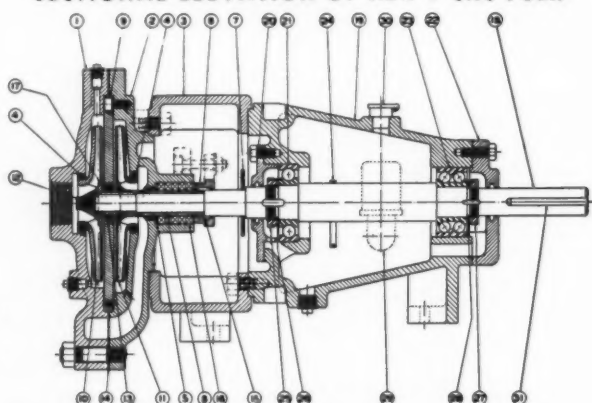
Type 1CH 2-stage pump is designed and priced for low-capacity, high head jobs

Here is another cost-saving addition to the Warren line of **Compacunit** Close Coupled Pumps.

Capacities - 5 to 60 gpm
Heads - 200 to 375 ft.

The new Warren 1 CH is important too for its simplicity and compactness . . . and every part is designed for long life and protection against wear. It is also available with a cradle mount (Type 1 CHC).

SECTIONAL ELEVATION OF NEW 1 CHC PUMP



DESIGNATIONS

1. Casing—1st Stage
2. Casing—2nd Stage
3. Frame
4. Case Ring
5. Stuffing Box Bushing
6. Gland
7. Flinger
8. Shaft Sleeve
9. Center Section
10. Impeller—1st Stage
11. Impeller—2nd Stage
12. Impeller Nut
13. Center Section Bushing
14. Gasket
15. Gasket
16. Packing Anchor No. 317
17. Impeller Key
18. Shaft

RATING CHART

1-CH or 1-CHC Bulletin										
HD GPM	5	10	15	20	30	40	50	60		
275	7½	7½	7½	7½	7½	7½	10	10		
300	7½	7½	7½	7½	7½	7½	10	10		
325	7½	7½	7½	7½	7½	10	10			
350	7½	7½	7½	7½	10	10				
375	7½	7½	7½	7½	10					

AVAILABLE IN THESE MATERIALS

PART	STANDARD	ALL IRON	ALL BRONZE
Suction Head	Cast Iron	Cast Iron	Bronze
Casing	Cast Iron	Cast Iron	Bronze
Impeller	Bronze	Cast Iron	Bronze
Impeller Nut	Bronze	Stainless Steel	Bronze
*Shaft	Steel	Steel	Steel
*Shaft Sleeve	Bronze	Cast Iron	Bronze
Seal Cage	Cast Iron	Cast Iron	Bronze
Gland	Cast Iron	Cast Iron	Bronze
Flinger	Cast Iron	Cast Iron	Cast Iron
Frame	Cast Iron	Cast Iron	Cast Iron

*Shaft sleeves available in Nitralloy Nitrided, Hardened Stainless steel or Monel and shafts in Stainless Steel or Monel on special order.

ASK FOR BULLETIN NO. 242



WARREN PUMPS, INC.
WARREN, MASSACHUSETTS

Burns and Roe, Inc.
New York, New York.
Design wind tunnel facility. Intermittent blow-down type—one supersonic and the other transonic. \$1,000,000. Client, Republic Aviation.

Henry J. Campbell, Jr.
Mineola, New York.
Huntington YMCA. Additions and alterations including swimming pool, gymnasium, and associated facilities. Huntington, N.Y. (mech., elec.) \$300,000. Client, Architect, A. J. Graesser.

Westbury office, Hempstead Bank, Westbury, N.Y. New Banking building. (mech., elec.) \$200,000. Client, Architect, Frank Majer.

Waldren's, Mineola, N.Y. Additions to warehouse, new offices, show-room—heating, ventilating, air conditioning, lighting, and electrical work. (mech., elec.) \$150,000. Client, Architects, Watterson & Watson.

Bohemia fire house, Bohemia, N.Y. New truck room, meeting and training facilities, control room, recreational areas. (mech., elec.) \$175,000. Client, Architect, Carl B. Stoye.

Singmaster & Breyer.
New York, New York.
Design expansion of caustic chlorine plant, including cell house, brine facilities, and chlorine liquefaction using mercury cells. Client, Pennsylvania Salt Mfg. Co.

Engineering, design, procurement, and construction of large caustic-chlorine plant. Client, Jefferson Chemical Co., Inc.

Complete engineering and design of plant including engineering for process, on-site facilities including laboratories, warehouse, water distribution. \$150 million (approx.) Client, Olin-Revere Metals Corp.

Engineering designs and specifications for 30 t/d sulfur plant. Client, Esso Research & Engineering Co.

OHIO

Parsons, Brinckerhoff, Hall & Macdonald.
New York, New York.

Determination of least expensive industrial building structure in terms of volume measured between floor line and lower truss chord of single story buildings, varying in floor area from 100,000 to 1,000,000 square feet. Client, B. F. Goodrich Co., Akron, Ohio.

Preparation of contract drawings and specifications for additional im-

CONSULTING ENGINEER

Hot Water

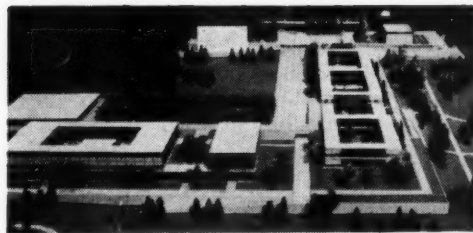
One of the three
C-E LaMont
Hot Water Boilers
being installed at
Forbes Air Base,
Topeka, Kansas.

TODAY'S NEW IDEA IN BIG-SPACE HEATING

Maybe hot-water heating doesn't sound like a new development to you. But it may be news to you that water at very high temperatures — up to 470° F and 500 pounds pressure — is coming to the fore as an advantageous method of heating large areas.

A big factor in bringing this trend about is the C-E LaMont Controlled Circulation Hot Water Boiler. Using the same principle applied by C-E in many of the country's largest utility boilers, this new boiler provides a degree of temperature control that makes it the most attractive method of heating in many cases. Examples of highly successful applications are industrial plants, large institutions, air bases and other military installations.

There are many cases, of course, where steam may still be the best choice. But here is an important point: whichever may be best for you, C-E, with its complete line of boilers of all types, can supply the equipment best suited to your particular situation. And, Combustion's wide experience is available to you and your consultants in finding the right answer. For details on C-E high-temperature water boilers, write for Catalog HCC-2.



Model of the country's newest service school, the U. S. Air Force Academy at Colorado Springs, where five C-E Hot Water Boilers will serve living, academic and service areas. Recognition of this system's advantages is shown by the fact that this same type of equipment is in service or on order for such Air Force Bases as Dover, Portsmouth, Forbes and McGuire... for industrial plants like Convair Astronautics Div. of General Dynamics Co., The Cross Co., Erie Mining Co. and Marquardt Aircraft Co... and for such institutions as the A. E. Smith High School in Riverview, Mich.

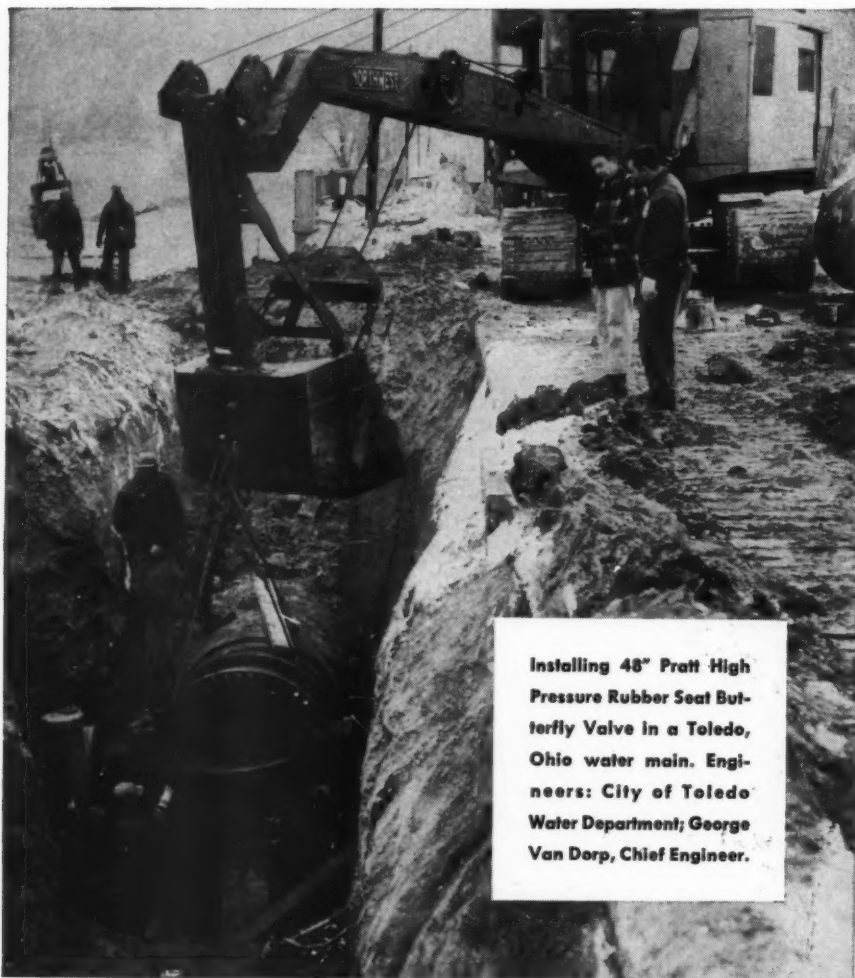
COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.



B-991

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; POLYMERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



Installing 48" Pratt High Pressure Rubber Seat Butterfly Valve in a Toledo, Ohio water main. Engineers: City of Toledo Water Department; George Van Dorp, Chief Engineer.

TOLEDO...Chooses Henry Pratt Butterfly Valves for Water Mains

Long after this valve is buried, in six months or sixty years, it will still be **easily opened or closed by one man using a standard tee-wrench.** The design features of Pratt Valves are aimed at the kind of honest dependability you need for water main use...the disc edge is corrosion-resistant and seats accurately in a rubber liner made extra-heavy to prevent permanent set. The one-piece stainless steel valve shaft rotates in lifetime lubricated bronze bearings, and the operator is permanently lubricated and sealed to withstand seepage.

In 1956, the City of Toledo purchased 13 Pratt Rubber Seat Butterfly Valves for its water mains, in 24", 30", and 48" diameters. All of them were designed for buried service without the need for protective vaults around valve or operator, **adding substantial savings in installation costs** to their proven freedom from maintenance problems.

Pratt engineers stand ready to help you select valves for distribution service or any water works application. Call on them with your next valving problem.

Have you sent for your copy?...of Pratt's 40 page Manual of Rubber Seat Butterfly Valves. Useful—contains latest pressure drop and flow data, conversion tables, butterfly valve theory and application. Manual B-2-J.



HENRY
PRATT

RUBBER SEAT
Butterfly Valves

Henry Pratt Company, 2222 S. Halsted St., Chicago 8, Ill. Representatives in principal cities

provements to Meander Creek water purification plant. Client, Mahoning Valley Sanitary District.

WASHINGTON

N. W. Haner & Associates.
Portland, Oregon.
Washougal River bridge. (struc.) \$38,000. Client, Skamania County.

WYOMING

Volk & Harrison.
Casper, Wyoming.
Veterans Administration Hospital addition, Cheyenne, Wyo. (struc.) \$1,500,000. Client, Porter & Porter,
Cheyenne police building, Cheyenne, Wyo. (struc.) \$300,000. Client, Porter & Porter, Arch., Cheyenne.
Addition to Student Union Building, Laramie, Wyo. (struc.) \$500,000. Client, Holzinger-Schropfer, Arch.
Medical clinic building, Casper, Wyo. (struc.) \$300,000. Client, Robert Wehrli, Arch., Casper.
Geriatrics building, Wyoming State Hospital, Evanston, Wyo. (struc.) \$200,000. Client, Kellogg & Kellogg, Arch., Cheyenne.
Kerfoot Dam on Bates Creek, near Casper, Wyo. Joint venture with Elmer N. Johnston. \$300,000. Client, Bates Creek Irrigation District.

FOREIGN

John Graham and Company
Seattle, Washington.
Regional shopping center located near downtown business center. 1,000,000-sq-ft rentable store area with parking space for 7000 automobiles. Two-level parking with stores located on both levels. In addition to store area Center will have 14-story, 10,000-sq-ft office building topped by revolving restaurant. \$20,000,000 (store area only). Client, Hawaiian Land Co., Honolulu.

W. H. Hermes III, P.E.
San Diego, California.
Residence, Tijuana, B. C., Mexico. 20 tons air conditioning, 8000 sq ft, 6 baths, well and pump plant and reservoir. Purchase all equipment and materials and supervise construction. (mech., elec.) \$12,000 (elec. only), \$50,000 (mech. only). Client, Owner.

Three theaters in Chihuahua, Mexico. All mechanical engineering and air conditioning. (mech.) \$200,000 (mech. only) Client, Owner.

Three-story office and store building. Mexicali, Baja, Calif. Air condi-

CONSULTING ENGINEER

A NEW IDEA IN POWER DISTRIBUTION

WESTINGHOUSE

UNI-BUS

better because it's completely safe to use...

It is impossible to touch live parts when handling Uni-bus, new Westinghouse power distribution system. The foolproof plug outlet (safety slide) cannot be opened until the plug-in device is fastened to the busway.

Even after the plug-in device has been secured to the busway, the slide remains closed. Thus, wiring can be made with all parts electrically dead. Not until the interlocked cover is closed and the safety slide opened (with screw driver, as shown) is electrical contact made.

For added protection, triple-wrapped insulation on all bus bars safeguards against any object making live contact through the ventilated openings.

Lightweight Uni-bus is available now from Westinghouse, and features other exclusive advantages such as the flexible connector which simplifies layout and installation. Ask your Westinghouse distributor. Or write for booklet, B-7015. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

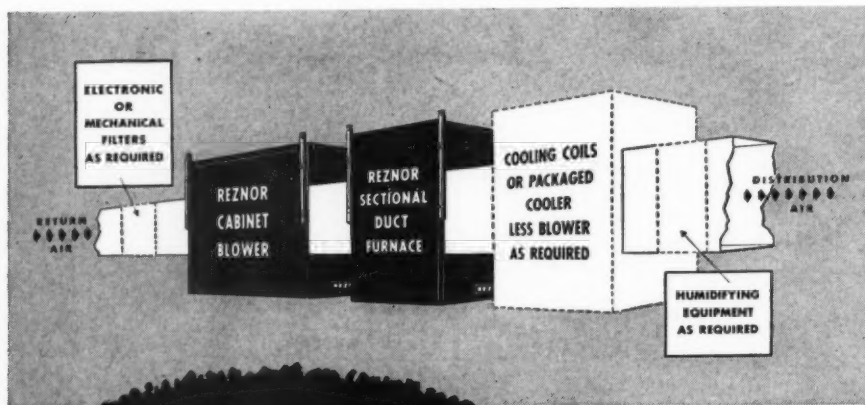
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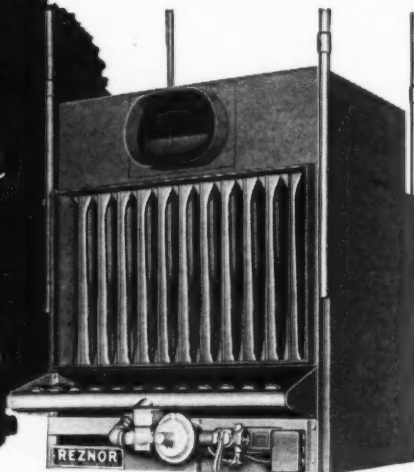
YOU CAN BE SURE...IF IT'S

Westinghouse

PLUG-IN LOW-IMPEDANCE BUSWAY



How to Match a Heating System to Exact Job Requirements



Reznor sectional duct furnaces free the designer from the limitations imposed by packaged heating equipment . . . equipment which can't be *exactly right* for any one job because it has to be *good enough* for so many different jobs.

A heating or heating-cooling system designed around a Reznor duct furnace can be matched to exact job requirements. Each duct furnace is a compact, highly efficient heat exchanger with a full set of operating controls. All other components,—for air moving, cooling, cleaning and moisture control—are separately specified and installer-supplied. Only those components which are necessary on the particular job need be included, with each individually selected to fit that one job.

Sectional assembly (a completely new concept in duct heating equipment) completely eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct heating systems. With the Reznor Series DS sectional duct furnace, systems with capacities in excess of 2,000,000 Btu can be assembled on the job from sections weighing no more than 315 pounds. Each of four basic sections—150, 200, 250, and 300 thousand Btu—is complete with controls and is provided with its own built-in draft diverter, flue connections and mounting pipes.

If you aren't taking advantage of the design flexibility of Reznor sectional duct furnaces, you're missing a good bet on many of your commercial, industrial and institutional jobs. Don't delay getting all the details on this versatile line of heaters. Give your nearby Reznor distributor a call—today.



Reznor Manufacturing Co.,
78 Union St., Mercer, Pa.

for complete details,

wherever
you are . . .



tioned. (mech.) \$30,000 (mech. only)
Client, Owner.

Daniel Koffler, P.E.

New Castle, Delaware.
Manufacturing plant, Manila, Philippine Islands. General consultation and reports. Client, South Seas Trading Corp., New York, N.Y.

Apartment house, St. Bernardino, Caracas, Venezuela. Reinforced concrete, hillside site luxury duplex apartments. General consultation. (struc., mech.) Client, Luis Gonzales, Caracas, Venezuela.

Miner and Miner

Greeley, Colorado.
Furnish all engineering design and supervision for Lebanon Power Transmission System project. Client, U.S. Government.

Foster D. Snell, Inc.

New York, New York.
Design, engineer, and supply first synthetic detergent plant in Bombay, India. Client, Swastik Oil Mills.

Smith, Hinchman & Grylls

Associates, Inc.
Detroit, Michigan.
Medical science building and master plan for medical college. Client, Yonsei University, Seoul, Korea.
National mental health hospital, Korea.

Vitro Engineering Company.

New York, New York.
Design and construct 500,000-kw (thermal) nuclear power station near Rome, Italy. \$46,400,000 (est.) Client, SIMEA (Societa Italiana Meridionale Energia Atomica), Italy.

Lev Zetlin, Consulting Engineer.

New York, New York.
Hebrew University medical center, Jerusalem, Israel. Reinforced concrete flat plates, 12-story buildings featuring holes at face of most columns for mechanical installations. (struc.) \$12 million. Client, Hadasah Organization, U.S., J. Neufeld.

Herbert Manuccia, P. E.,

and Associates.
Washington, D.C.
Capehart housing, Hickam Field, Hawaii. (civil, struc.) \$10,000,000. Client, Groll, Beach Assoc., Arch., Washington, D.C.

Parsons, Brinckerhoff,

Hall & Macdonald.
New York, New York.
California-Texas Oil Co., Indonesia. Report on alternate types and comparative costs of structures suitable for bridging Kampur River. ▲▲

How Hartzell Duct Fans Help Cut Ventilating Costs

• Lower Equipment Cost

Hartzell fans are competitively priced . . . yet they're designed and built for maximum reliability and long life. When you compare prices, estimate the service life of each make and rank them on the basis of cost per year of useful life. On that basis, Hartzell fans will always be by far your best buy.

• Lower Installation Costs

Hartzell duct fans are much easier to install than many other types of ventilating equipment which might be used to do the same air-moving job. Each fan is a completely pre-fabricated duct section. To install a Hartzell duct fan you need only cut a section of duct work the same length as the fan, bolt angle iron flanges to the duct ends and bolt the fan to the flanges. After that, just install bracing and make electrical connections and you're done. Easy installation means fast installation . . . and real savings on costly labor charges.

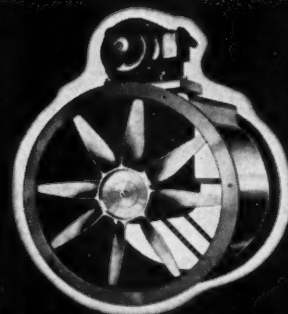
• Lower Maintenance Costs

Hartzell duct fans require practically no maintenance. Their rugged construction and the high standards of quality in workmanship and materials to which they must conform practically eliminate failures under normal operating conditions. Routine maintenance requires nothing more than periodic lubrication and occasional replacement of belts. Motors on direct-drive models and bearings on belt-drive models are Alemite-lubricated from outside the duct. Belt changes or adjustments on belt-drive models are also conveniently made from outside the duct. Hartzell design and construction holds maintenance to a minimum . . . and that's a vital consideration under today's wage scales.

For complete details on Hartzell duct fans and how they can help you cut your air-moving costs, just call your nearby Hartzell field engineer. If you don't know him, just drop us a line for his name and address. And be sure to ask for Bulletin A-109.

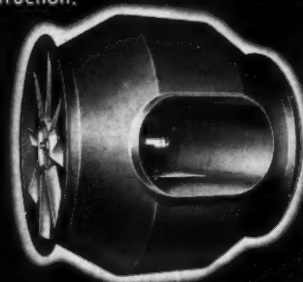
Why You Can Count on Hartzell Air-Moving Equipment for Long Life, Rugged Reliability and Minimum Maintenance

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.



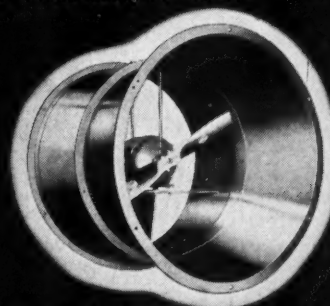
BELT DRIVE DUCT FAN

These fans are the best choice for most installations where air (including that containing fumes, corrosive elements or dust) must be moved through a duct. Fourteen sizes, 12" to 60" fan diameters; single-propeller, two-propeller or multi-blade models in belt-drive or direct-drive construction.



BI-PASS DUCT FAN

This special model, with motor mounted in a tunnel completely out of the air stream, is designed for moving corrosive fumes and air at temperatures as high as 550° F. Six sizes, 19" to 41"



REVERSIBLE DUCT FAN

This fan moves air in either direction with equal efficiency and can be supplied with controls for manual or automatic reversal. It is useful in many ventilating applications as well as in cooling and drying processes. Four sizes: 18" to 44".

HARTZELL PROPELLER FAN CO.

Div. of Castle Hills Corp.

304 Thomas Blvd. • Piqua, Ohio



ENGINEERING OFFICES
IN PRINCIPAL CITIES



Men in Engineering

Elmer R. Queer, director and professor of engineering research, Pennsylvania State University, has been nominated for the presidency of the American Society of Heating and Air-Conditioning Engineers. Other nominees are: first vice president, Arthur J. Hess, Hess-Greiner & Polland, Los Angeles; second vice president, Walter A. Grant, Carrier Corp., Syracuse, N.Y.; and treasurer, John H. Fox, Honeywell Controls, Ltd., Ontario, Canada.

The Gold Medal Award of the Illuminating Engineering Society has been awarded to Professor John O. Kraehenbuehl, who recently retired as professor emeritus in electrical engineering at the University of Illinois, Urbana. The award was in recognition of his far-reaching effect on the techniques of illumination in his long academic career.

Five members of the Illinois Association of Consulting Engi-

neers have been named to the newly created State Building Code Committee. They are: Harry H. Cordes, Rockford; Silas Cartland III, Park Ridge; Robert Hofmann, Dixon; Charles H. Merchant, and Samuel J. Sibley, both of Springfield.

New members of the IACE are: Robert E. Hamilton, Consulting Sanitary Engineer, Joliet; John S. Horner, Libertyville; Mack Kinch, Urbana; Joseph K. Knoerle, Knoerle & Associates, Chicago; and Charles H. Sheppard, Sheppard, Morgan & Schwab, Alton.

Simmerson & Bell, Engineers, and K. C. Mock and Associates, Engineers and Surveyors, have opened joint offices at 205 Worth Ave., Palm Beach, Fla. The firm will offer complete engineering services on industrial development, commercial and industrial building, shopping centers, airports, highways, and utilities.

Hennessy, Riedner & Associates, Inc. have moved to 6005 Wayzata Blvd., Minneapolis.

David F. Shaw has joined Kaiser Engineers Division of the Henry J. Kaiser Co. as a member of the board of directors.

Adache Associates, Cleveland, Ohio, have moved to new offices in the Penthouse, Hotel Hollenden, Cleveland, Ohio.

Jacob Stair, Jr., formerly electrical engineer of the Pennsylvania Railroad, has joined the firm of Gibbs & Hill, Inc.

Paul W. Anderson and Donald J. O'Connor have returned to the firm as consulting mechanical and sanitary engineers, respectively, and W. Wesley Eckenfelder has become a consulting sanitary engineer on the staff.

The Fluor Corp., Ltd., Los Angeles, has established a wholly-owned subsidiary in London, England, to take advantage of the

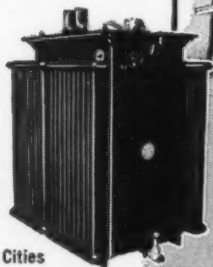
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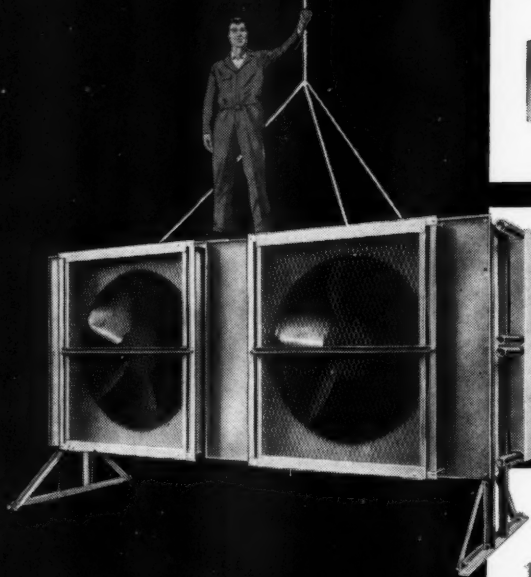
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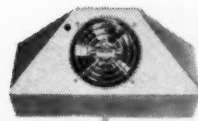


KRAMER PRODUCTS

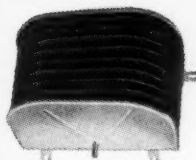
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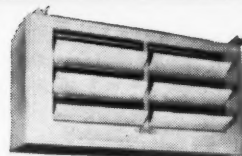
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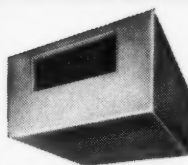
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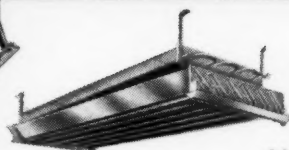
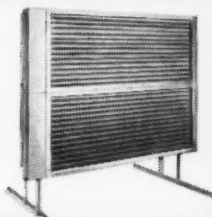
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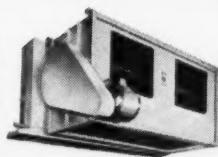


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Spillway Structure, Greater Chao Phya Project—Royal Irrigation Department

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rapid expansion of the petroleum and petrochemical industries in the sterling areas and free Europe. James Tathwell will head up the new firm, to be known as The Fluor Engineering and Construction Co., Ltd.

Arthur A. Sauer, structural engineer of Sacramento, Calif., has been appointed a director of the Consulting Engineers Association of California, replacing George E. Goodall, of Sacramento, who resigned because of ill health.

Dr. Max J. Gleissner has been appointed to the position of chief engineer and assistant manager for Falcon Air Maps Co., Denver, Colo. Dr. Gleissner recently retired as Chief, Field Surveys, U.S. Geological Survey.



GLEISSNER



BROWN

Gerald H. Brown has been elected vice president and construction manager of United Engineers & Constructors, Inc., Philadelphia.

The Austin Company has appointed Michael P. Superak as district engineer in northern California. He has served as supervisory engineer and project engineer on a number of important projects in the area, including Boeing Aircraft Company's jet transport manufacturing facilities at Renton, Wash.

Assistant district manager for the Pacific Northwest will be Brown W. Saveland, with headquarters at Seattle, Wash.

David F. Shaw, Assistant General Manager for Manufacturing for The Atomic Energy Commis-

CONSULTING ENGINEER

MEMO TO CONSULTANTS:

Exclusive with Stran-Steel Buildings—

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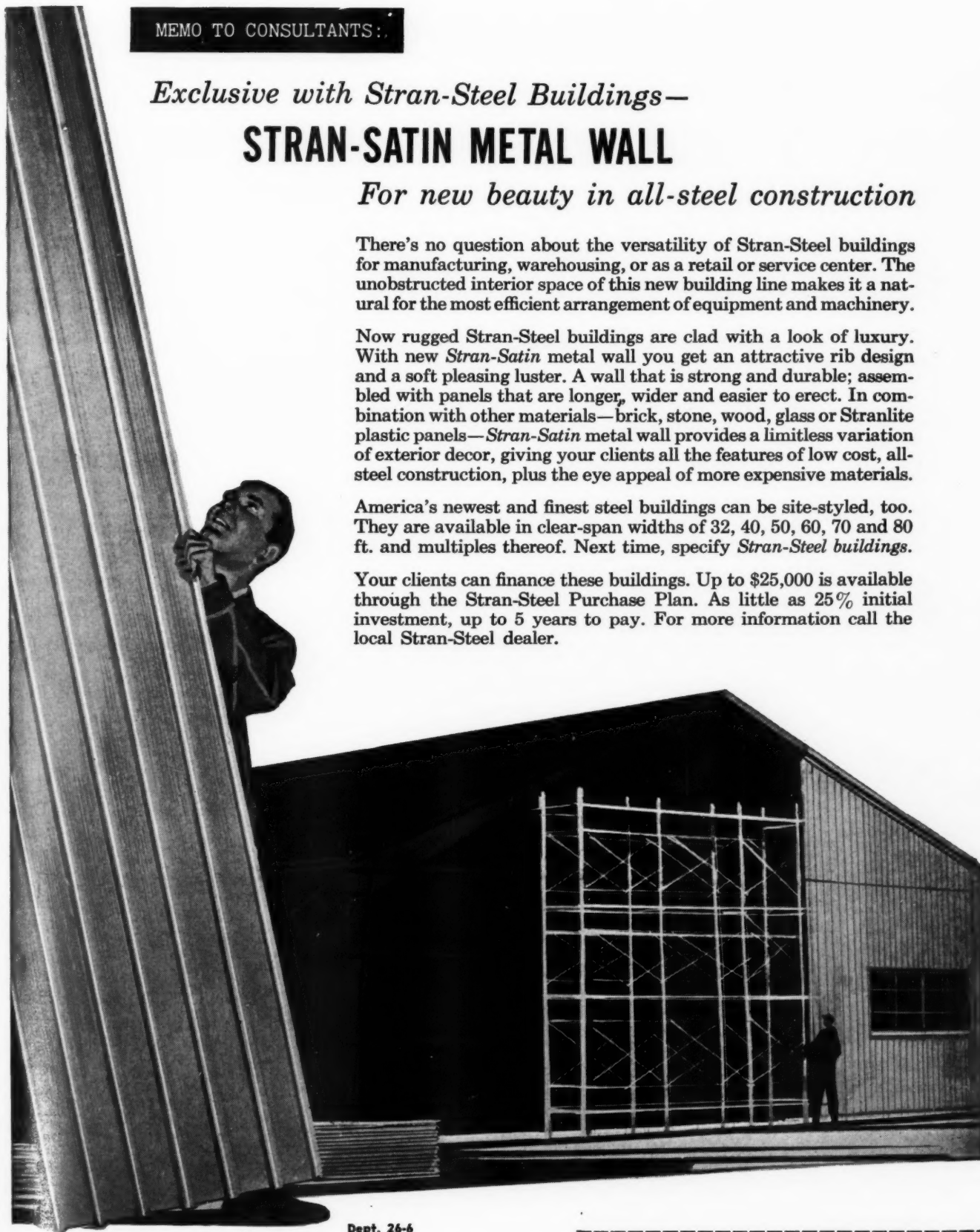
For new beauty in all-steel construction

There's no question about the versatility of Stran-Steel buildings for manufacturing, warehousing, or as a retail or service center. The unobstructed interior space of this new building line makes it a natural for the most efficient arrangement of equipment and machinery.

Now rugged Stran-Steel buildings are clad with a look of luxury. With new *Stran-Satin* metal wall you get an attractive rib design and a soft pleasing luster. A wall that is strong and durable; assembled with panels that are longer, wider and easier to erect. In combination with other materials—brick, stone, wood, glass or Stranlite plastic panels—*Stran-Satin* metal wall provides a limitless variation of exterior decor, giving your clients all the features of low cost, all-steel construction, plus the eye appeal of more expensive materials.

America's newest and finest steel buildings can be site-styled, too. They are available in clear-span widths of 32, 40, 50, 60, 70 and 80 ft. and multiples thereof. Next time, specify *Stran-Steel buildings*.

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Minneapolis 4, Minn., 708 S. 10th St.
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Combustion is 80% completed within the burner itself and takes place with a whirling, short flame that attains heat release rates of over 1,000,000 BTU/hr per cu ft. Products of combustion are clean and sufficient excess air for tempering the products may be introduced through the burner itself without causing smoke or instability.

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Complete units from 3,500,000 BTU/hr to 50,000,000 BTU/hr are available and may be fitted for steam, compressed air or mechanical atomization. With dual fuel arrangements switching from gas to oil is accomplished without shutdown.

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Gas-electric or torch ignition allows full ignition in a few seconds—even with a cold burner.

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REPRESENTATIVES IN PRINCIPAL CITIES



sion, has resigned his post to become vice president of Kaiser Engineers Division of the Henry J. Kaiser Co. A. L. Lindsay, Jr., has been appointed Manager, Nuclear Engineering Development, stationed in Tokyo, Japan.

Ebasco Services Inc. has moved its Central Regional office to the Field Building, 140 S. Clark St., Chicago.

New members voted into the Minnesota Association of Consulting Engineers are: Douglas E. McShannock and Douglas Wolf-angle (associate members) both electrical engineers with Ellerbe & Co.; Donald R. Chapman (assoc. mem.), civil and structural engineer with Grover Dimond Assoc., Inc.; and Donald V. Knapp (full mem.), electrical engineer.

Other new members are: Robert C. Raugland, Ralph P. Fredrickson, and Ben Mayeron.

Mark F. Deering, structural engineer, a member of the firm of S. B. Barnes & Associates, Los Angeles, has been appointed to the Board of Building and Fire Code Appeals of the City of Burbank, Calif.

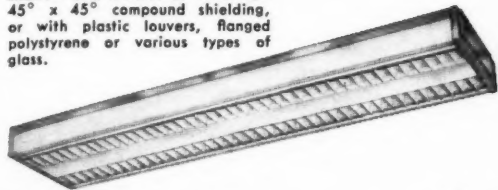
Anton J. Eichmuller, P.E., Consulting Electrical Engineer, has moved his firm's offices to 408 The Arcade, Cleveland, Ohio.

William A. McWilliams, formerly chief engineer of the Delaware State Highway Dept., has joined the firm of De Leuw, Cather & Co. as executive assistant to the managing partner. Offices are at 202 E. 44th St., New York City.

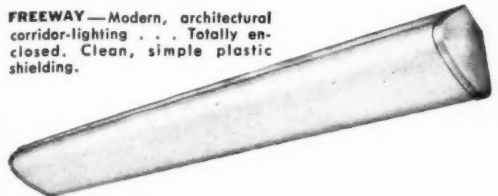
Officers of the Instrument Society of America for 1957-1958 are: president, Robert Jeffries, Daystrom, Inc.; president-elect-secretary, Henry C. Frost, Corn Products Refining Co.; vice president of the general relations department, Philip A. Sprague, The Hays Corp.; vice president of the industries department, Dr. Ralph

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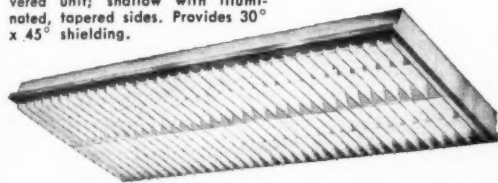
FREEWAY — Modern, architectural corridor-lighting . . . Totally enclosed. Clean, simple plastic shielding.



CIVIC — an architectural form . . . shallow, good-looking and in excellent taste. An extruded aluminum-framed unit.



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Charles Kleinschmidt and Harry Bailey, Louisiana representatives, members of Smithcraft's nation-wide sales-engineer organization, demonstrating the New Smithcraft TWOSOME.



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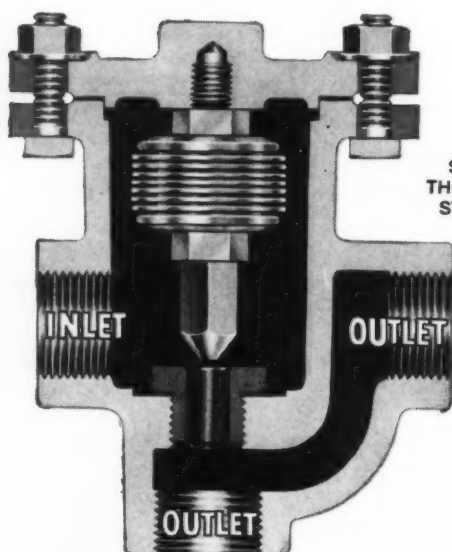
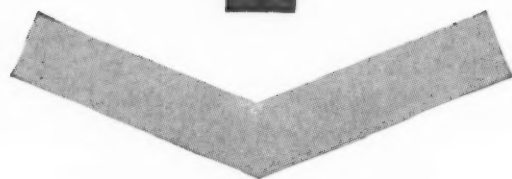
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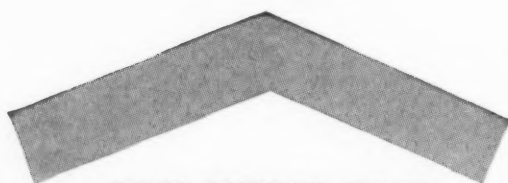
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H. Tripp, Grumman Engineering Corp.; district vice president of the eastern states, Carl W. Gram, Jr., Mason-Neilan Division of the Worthington Corp.; district vice president of the southeastern states, John T. Elder, Tennessee Eastman Co.; district vice president for the midwest, Gordon D. Carnegie, King Instrument Co.; district vice president of the southwest region, John F. Draffen, Monsanto Chemical Co.; and west coast district vp, Adelbert Carpenter, Fisher & Porter.

The EJC nominating committee has chosen Enoch R. Needles, senior partner in Howard, Needles, Tammen & Bergendoff, as president for next year. Named by the committee as nominee for vice president was O. B. J. Fraser, assistant manager, development and research department, International Nickel Company. Needles represents the ASCE, Fraser the AIME. The nominations will be submitted to the EJC board at a Nov. 15 meeting. The new officers will take over their positions at the close of the first January meeting.

Joseph J. Salvatorelli has been elected assistant vice president of Albright & Friel Inc., Phila.

The firm recently opened a new office in the Fox Bldg., which is located adjacent to their offices in Three Penn Center Plaza. John G. Gruss is in charge.

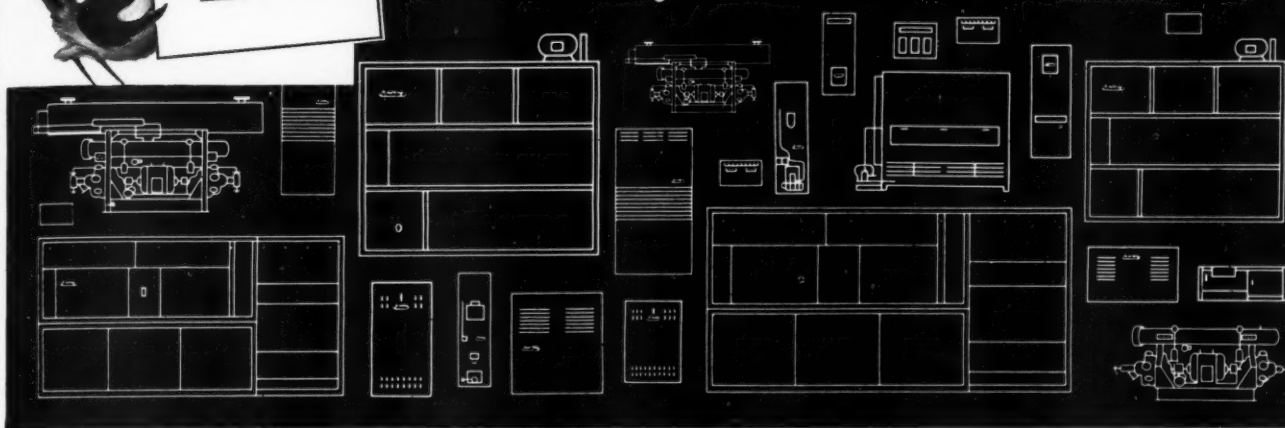
Clinton C. Steward has been named assistant manager in charge of engineering and process of the Petro-Chemical Division of Holmes & Narver Inc., of Los Angeles. Before joining Holmes & Narver, Stewart served for nine years as chief engineer of the Ralph M. Parsons Co., also of Los Angeles.

Harry H. Smith and Jack C. Hacker have formed the firm of Smith and Hacker, Consulting Engineers. The firm's offices are at 28 High St., Orange, N.J. Both

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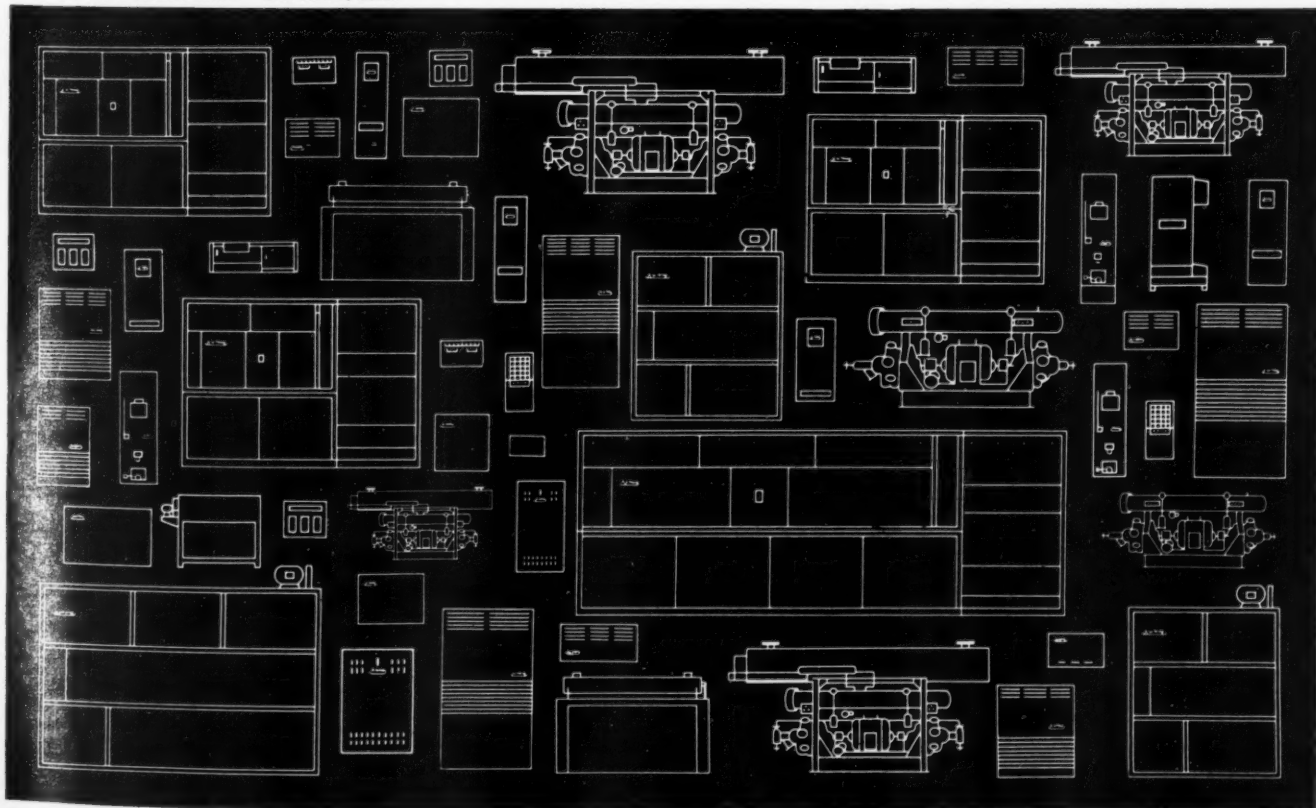
tems, centrifugal chillers, and individual room air conditioners. Phone your factory-trained AIRTEMP dealer. He's in your Yellow Pages.

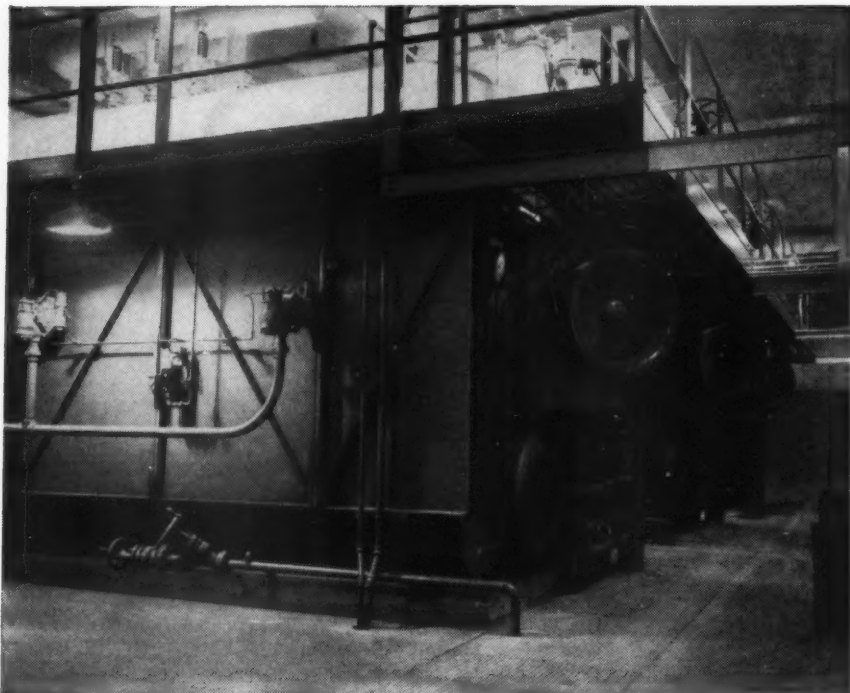
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Here are three Bros Packaged Watertube Boilers on the line at the Bell Aircraft, Kenmore, N. Y., plant. Steam generated is used primarily for

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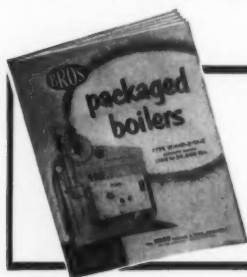
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No extended work interruptions

or erection problems are encountered when you install a Bros Packaged Boiler. It can be lifted or skidded into place. Costly foundations and accessories are not required.

Bros Packaged Boiler capacities run from 4,100 to 30,000 lbs. of steam per hour with design pressures up to 600 psi. Available with or without burning equipment, oil and/or gas. Choice of manual, semi-automatic or fully automatic controls.



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partners formerly were associated with Edwards, Kelsey, and Beck, Consulting Engineers. Smith more recently represented Severud-Elstad-Krueger Associates on the Dew Line Project.

Lester R. Moskowitz has organized an industrial technical consulting firm under the name of L. R. Moskowitz & Associates. Offices are at 3068 West 25th St., Erie, Pa. He formerly was chief development engineer of the Eriez Mfg. Co.

Jones, Henry & Williams, Consulting Engineers, Toledo, Ohio, have added to their staff Lynn M. Miller, formerly assistant chief of the Water Resources Section of the Michigan Department of Conservation. He will devote the major portion of his time to water supply projects.

Lewis Levine has been appointed head of the bridge design section of the Ewin Engineering Corp., Washington, D.C.

Three Minneapolis-St. Paul engineers, Cliff Olson, Bob Emanuelson, and Harold March, have established the consulting engineering firm of Olson, Emanuelson, and March. The firm will offer services in mechanical and electrical design. All three men formerly were members of Magney, Tusler, and Setter.

A new firm, Harco Engineering Co., has been formed with offices at Terminal Island, Calif. Officers are: John Rados, president; R. G. Rados, vice president; V. J. Bacica, secretary-treasurer; U. W. Hird, general manager; J. A. Botich, assistant manager and chief engineer; L. A. Bell, assistant manager of production; and A. W. Wall, assistant manager of coordination and estimating.

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EARLY STRENGTH—Sikacrete is a liquid admixture which causes rapid strength development in concrete and mortar. Sikacrete saves hours of overtime finishing and reduces the possibility of damage by freezing. Floors may be opened to traffic sooner.

STRUCTURAL BENEFITS—Sikacrete contains Plastiment densifying agent which gives these structural benefits: greater density, hard non-dusting surfaces, increased ultimate strength, and reduced cracking.

PLACEABILITY—The easy placeability of a stiff Sikacrete mix will surprise the most experienced concrete men. Sikacrete concrete with a 3" slump will be as easy to place as plain concrete with 5" slump. The excellent troweling characteristics will enable the finisher to provide a superior finish.

PROPORTIONS—Sikacrete proportions may be varied to suit job conditions. Normally 1½ gallons are used per cubic yard.

ECONOMY—In addition to lower finishing costs, early strength reduces both the time and cost of cold weather protection. You will increase structural quality and pocket savings greater than the cost of the Sikacrete.

OTHER USES—Sikacrete is also a moneysaver when laying brick or masonry units, and when placing structural concrete in cold weather. Advantages include faster job progress, improved quality, and the reduction or elimination of white deposits of efflorescence.

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**SIKACRETE® ACCELERATING
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Books

For the Libraries of
Consulting Engineers

SIMPLIFIED PROBLEMS IN STRENGTH OF MATERIALS AND STRUCTURAL DESIGN, by Ephraim Viertels; Arco Publishing Co., Inc.; 636 pp.; \$5.00.

Reviewed by
Frederick P. Wiesinger
University of Illinois
Chicago Undergraduate Division

This book is a collection of 735 problems with detailed solutions and answers from the basic field of structural design (except for

reinforced concrete). Something like this is badly needed to help the average office designer or the candidate for state-board examination—but unfortunately this is not it. The procedures given are often not explained. This forces those who would have a need for a book of this sort to memorize unnecessarily formulas and methods.

On the other hand when explanations are given, they are often incomplete or confusing.

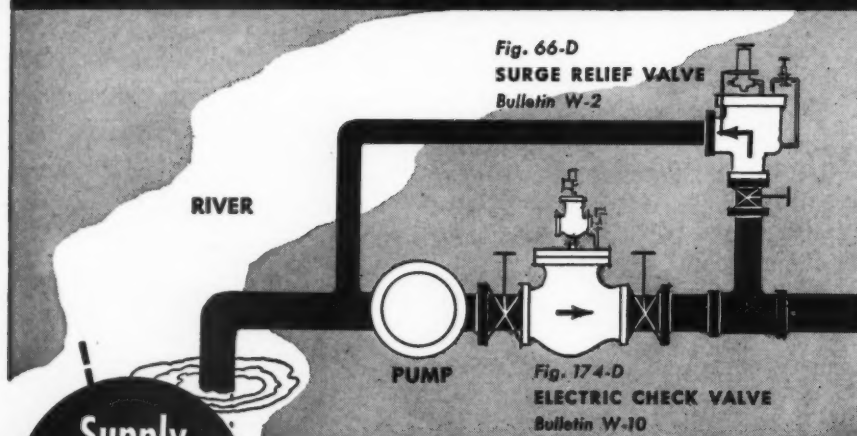
(For example, free-body diagrams are not mentioned at all.) The formulas and methods given are usually the most primitive available. This unfortunately creates not simplicity but cumbersome solutions. In some cases they are outright wrong, like designing laterally unsupported steel beams in buildings for L/b .

Some of the most blatant omissions are: how to locate the maximum moment if it is not under a concentrated load; how to compute moments for triangular loading; how to compute moments with the help of shear-diagram areas; how to place the loads to get maximum moments under moving loads.

The book carries a warm recommendation on the dust jacket by an unnamed prominent professor of an unidentified well-known eastern college of engineering.

It almost seems as if this were a warmed-up version of notes taken at a not-too-well organized refresher course by a not-too-bright but very diligent student.

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The G-A Cushioned Surge Relief Valve protects water lines against excessive surges in the system by automatically opening when the inlet pressure exceeds a predetermined setting.

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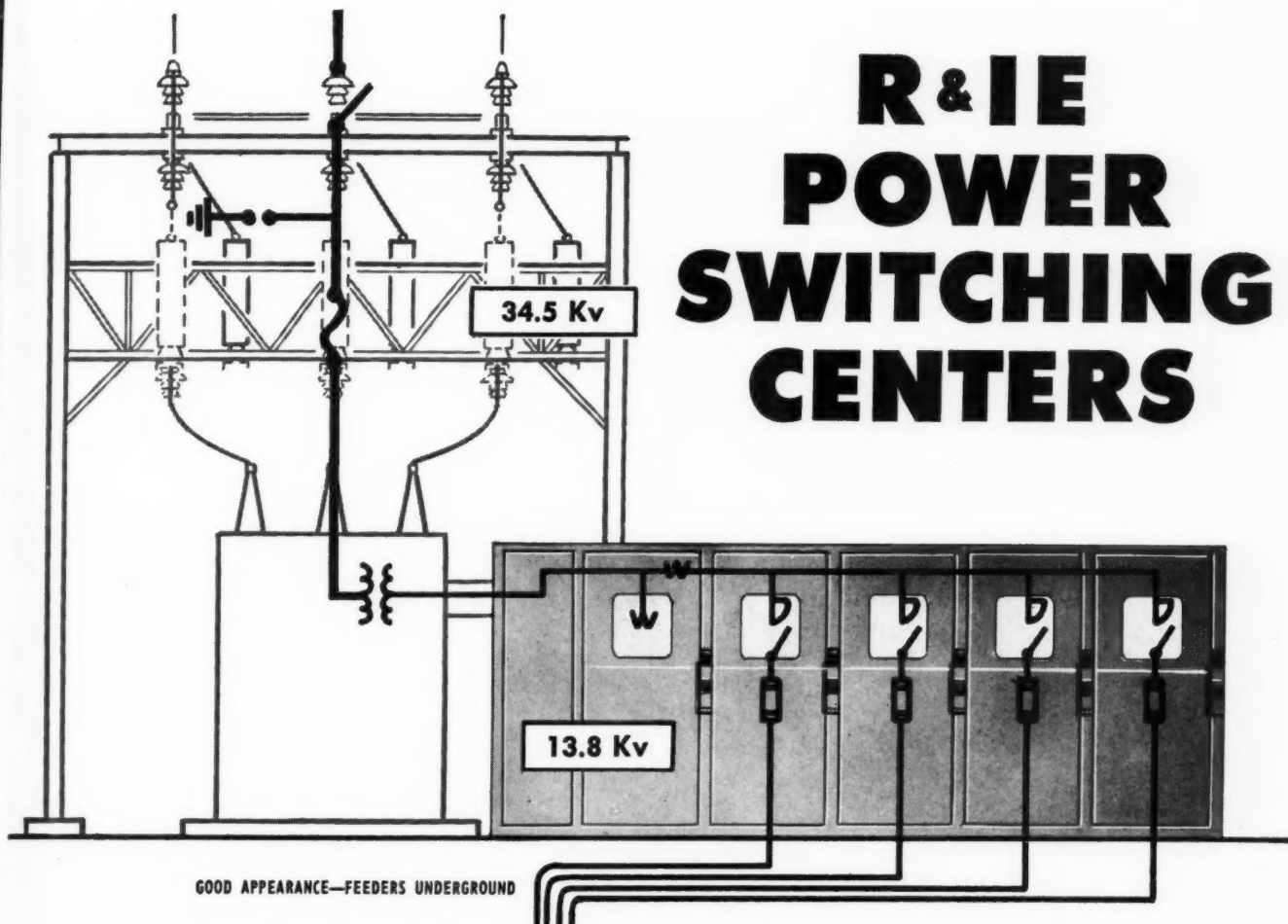
AMERICAN CIVIL ENGINEERING PRACTICE, Vol. III, edited by Robert W. Abbett; John Wiley & Sons, Inc.; \$25.00.

Reviewed by
Daniel D'Addona
McNamee, Porter & Seeley
Ann Arbor, Michigan

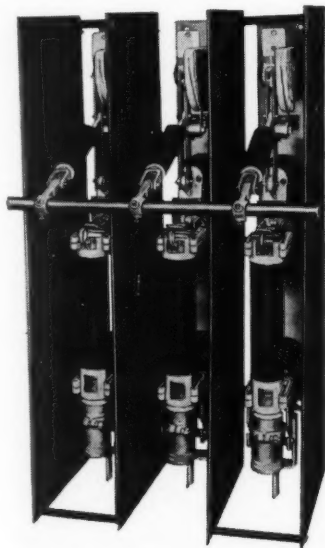
Volume III of *American Civil Engineering Practice* is a reference book dealing with design of structures. Volume I covered subjects such as traffic, highway, airport, and railroad engineering; surveying, foundations, soil mechanics, and tunnels. Volume II basically covered engineering problems dealing with water, such as hydraulics, river engineering, and sanitary engineering. Volume I and II were discussed in previous reviews (Feb. and April 1957).

Volume III consists of 13 chapters, each chapter quite complete

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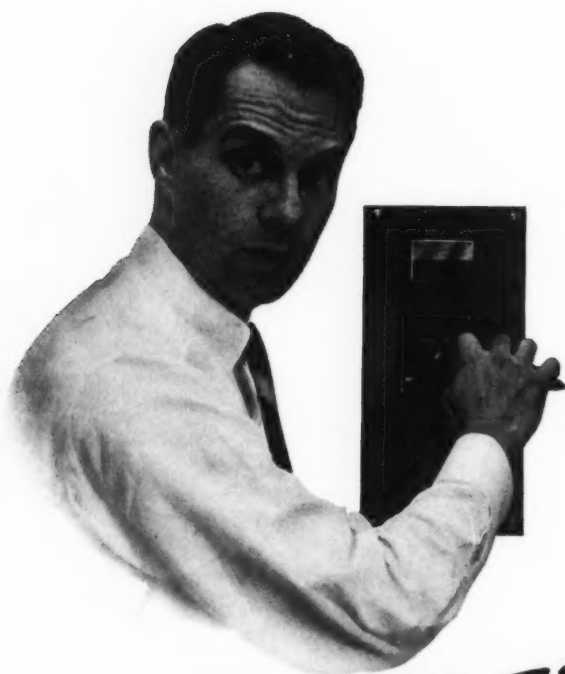
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in itself and written by one or more top men in that field, such as Hardy Cross, Raymond C. Reese, C. O. Dohrenwend, and Paul J. Brennan, to mention only a few who have contributed to this volume.

The 13 chapters are: Theory of Structures; Masonry and Plain Concrete; Reinforced Concrete; Prestressed Concrete Structures; Footings, Piers, and Abutments; Retaining Walls; Steel Bridges; Reinforced Concrete Bridges; Buildings; Steel Towers, Masts, Tanks, Bunkers, Bins, Light Gage Steel Construction; Reinforced Concrete Chimneys, Silos, Bins, Elevators, Tanks, and Turbine Foundations; Timber Structures; Earthquakes and Earthquake Resistant Design.

Volume III is more than a reference book in that the authors try to explain the methods and assumptions they have garnered from years of experience. Most of the chapters are set up with discussions followed by sample problems. There is some duplication of material as the chapters are written by different authors and some chapters are very closely related. The subjects are presented very clearly and contain many diagrams. The diagrams in the prestressed concrete chapter are especially good. This book is strongly recommended for the library of consulting firms.

The three volumes of *American Civil Engineering Practice* were prepared under the editorship of Robert W. Abbett. He and his staff of specialists deserve wide praise from civil engineers everywhere for the monumental job that they have accomplished.

ALSO AVAILABLE

The following publications are available from the office of Technical Services, U. S. Department of Commerce, Wash. 25, D.C.

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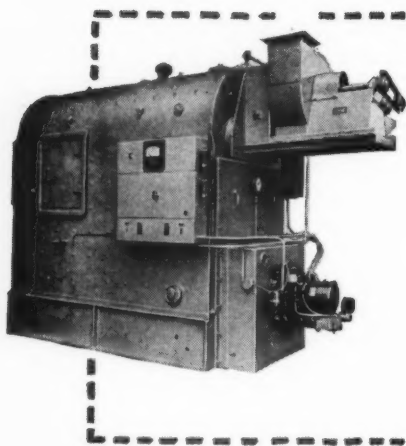
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by R. F. Trapp, Wright Air Development Center, 18 pp., 50¢, No. PB 121882.

"Infrared: A Library of Congress Bibliography, Part II," by M. W. Ayton, et. al., 156 pp., \$3.00, No. PB 121998.

"Packaging and Materials Handling, 1941-57," 10¢, No. CTR-72.

"Instructional Film Research Reports, Vol. II," U. S. Naval Training Device Center, 1033 pp., \$6.00, No. PB 131005. (Vol. I of this series, No. PB 111000, "Instructional Film Research 1918-1950," 185 pp., is still available at \$2.50.)

"Symposium on Advanced Programming Methods for Digital Computers," Office of Naval Research, 83 pp., \$2.25, No. PB 121670.

"Dynamic System Studies: Part 5 — Analog Computation," by F. W. Bratten, Naval Ordnance Laboratory for Wright Air Development Center, 78 pp., \$2.00, No. PB 121578.

"Dynamic System Studies: Part 6 — Operation and Maintenance Procedures for Analog Computers," by W. R. Allen, University of Chicago for Wright Air Development Center, 126 pp., \$3.25, No. PB 121792.

"Research on Elevated Temperature Resistant Ceramic Structural Adhesives, Part 2," by H. G. Lefort, R. M. Spriggs, and D. G. Bennett, University of Illinois for Wright Air Development Center, 74 pp., \$2.00, No. PB 121941.

APPRAISAL AND VALUATION MANUAL, Vol. II; The American Society of Appraisers; \$15.00.

Volume II does not repeat the material contained in Volume I (published in 1956) but is a completely new book of studies and articles covering a variety of ad-

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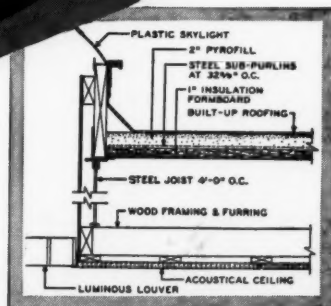
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The 1956 edition of the "ASTM Proceedings," 1510 pages, records the accomplishments of the American Society for Testing Materials for the year 1956. It includes technical reports and papers with discussions. Copies are \$12.00 each from ASTM, 1916 Race St., Philadelphia 3, Pa.

The 1957 "ACI Book of Standards," 300 pages, contains 11 ACI standards under one cover.

Included are such subjects as: the evaluation of compression test results; building code requirements for reinforced concrete; design and construction of concrete chimneys; winter concreting; selection of proper proportions for concrete; and the measuring, mixing, and placing of concrete. The book also discusses the application of portland cement paint, concrete pavements and bases, precast concrete floor units, construction of concrete farm silos, and the application of mortar by pneumatic pressure.

The American Concrete Institute also has ready the 4th edition of "ACI Manual of Concrete Inspection." This 240-page manual is available for \$3.50 from the Institute at P.O. Box 4754, Redford Station, Detroit 19, Mich.

A PROFILE OF THE ENGINEER (a series of three reports), Deutsch & Shea, Inc.; \$7.50.

This study brings together and analyses personality factors involved in engineer job satisfaction. In addition to the master chart of engineer characteristics, the book features a table summarizing important investigations of engineer personality characteristics, an appendix listing better-known engineer aptitude tests, and a bibliography. ▲▲